



Qatar Islamic Archaeology and Heritage Project

End of Season Report : 2011-2012

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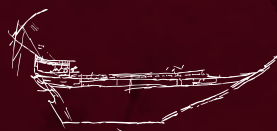
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End of Season Report

2011-2012



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APPENDIX 3 - QATAR ISLAMIC ARCHAEOLOGY AND HERITAGE PROJECT *PUBLICATIONS AND GREY LITERATURE*

1. INTRODUCTION TO THE END OF SEASON REPORT, 2011-2012

Stephen McPhillips

1.1 QATAR ISLAMIC ARCHAEOLOGY AND HERITAGE PROJECT IN 2011-2012

The Qatar Islamic Archaeology and Heritage Project (QIAH) was launched in 2008 at the initiative of their Excellencies Sheikha Al Mayassa Bint Hamad Bin Khalifa Al Thani, Chairperson of the Board of Trustees of the Qatar Museums Authority, and Sheikh Hassan Bin Mohammad Bin Ali Al Thani, Vice-Chairperson of the Board of Trustees of the Qatar Museum Authority (QMA). The project is run in collaboration between the QMA and the Institute for Cross-Cultural and Regional Studies at the University of Copenhagen. This collaborative project is under the co-direction of Professor Alan Walmsley (Archaeology), Professor Ingolf Theusen (Conservation and Heritage Management), Professor Morten Meldgaard (Environment) and Professor Jørgen Bæk Simensen (History). This report presents the results of archaeological excavations and survey in northern Qatar by QIAH in the 2011-2012 season (October 2011 to March 2012).

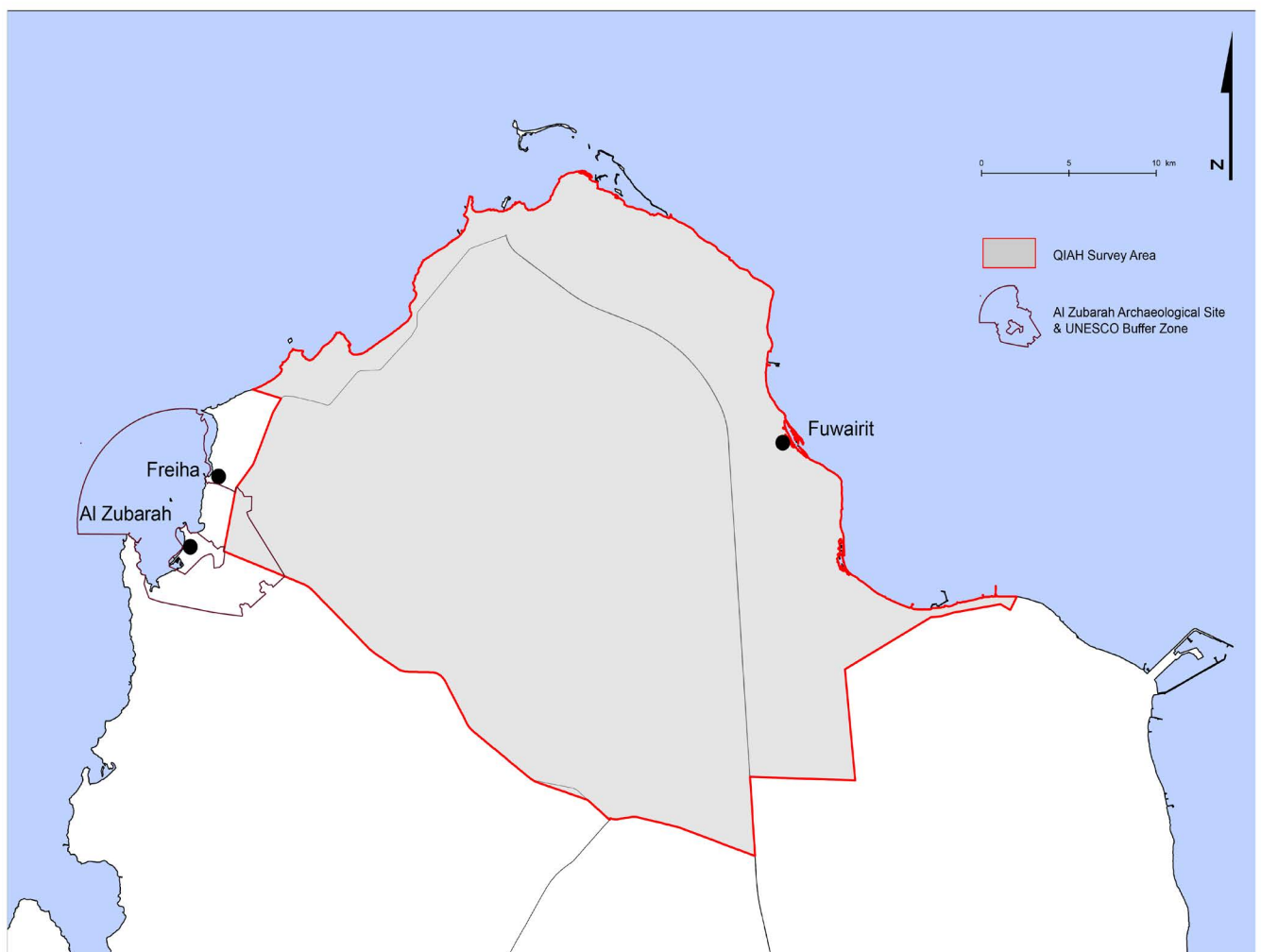


Figure 1.1: Map of northern Qatar showing the QIAH archaeological sites and survey area

1.2 ARCHAEOLOGICAL INVESTIGATIONS AT AL ZUBARAH IN 2011-2012 (SECTION 2)

The primary focus of work in 2011-2012 consisted of targeted excavation at Al Zubarah, and at the nearby site of Freiha. These addressed the key issues of the historical development of the two settlements, throwing new light on the towns' economy and aspects of everyday life. Excavation areas at Al Zubarah referred to in this report are shown in Figure 1.2 (for discussion of the open area excavation methodology employed by the project see: Richter et al. 2010: 37).

This season saw the completion of critical work at the Excavation Point 1 (ZUEP01), which provides a complete historical perspective of Al Zubarah from its formative development in the mid-eighteenth century, through to the twentieth century. Excavation point ZUEP01 affords us an unparalleled vista of the first settlement in this central area of the town, the earliest occupation attested thus far, Phase 6. The complex build-up of inter-related archaeological features provides an insight into everyday life in mid-eighteenth century households in Al Zubarah: tannurs, hearths, post-holes, and rubbish pits, constituting deposits rich in material culture (stone, metal and pottery artefacts) and ecofacts (botanical, faunal and marine-faunal specimens).

The expansion of archaeological investigation at Excavation Point 2 (ZUEP02) in 2011-2012, adjacent to what is likely to be the central commercial district of the city, revealed significant new results which graphically illustrate the significance of Al Zubarah in interregional trade networks. Attested in literary sources as a pearl-fishing centre, the presence in this excavation area of large quantities of ceramics imported from as far afield as Europe, East Asia and East Africa, as well as parts of the Arabian Gulf, is indicative of Al Zubarah's international trade connections in the eighteenth and nineteenth centuries. The discovery here of three large madbasas (date-presses), suggests that the compound had a function closely linked to storage and production, and related to the excavated suq located further to the north (QMA1). A significant number of large storage vessels were recovered as *in situ* abandonment deposits on floor surfaces in excavation spaces in ZUEP02.

A primary component of QIAH excavations at Al Zubarah in 2011-2012 was the expansion of work on the palatial compound (ZUEP04) on the southern perimeter of the site. Exposing more of this sizeable structure, the largest extant building in the town, revealed significant results which illuminate the life of its rulers and ordinary inhabitants alike in this domestic space. Extensive deposits of datable material include pottery, small finds, and significant numbers of coins, which confirm that this structure was founded in Phase 5. Examination of the central courtyard deposits revealed five sequences of surface resurfacing, which allows us to demonstrate that the palace underwent a continued process of renewal while occupied.

One further excavation area was opened at Al Zubarah in 2011-2012, Excavation Point 10 (ZUEP10), to better understand the northern outer city wall, and investigating aspects of its construction in order to inform conservation work. This established the function of the area around Tower 8 and determined a dating spectrum based on the established Al Zubarah phasing. Work here revealed a tightly packed sequence of archaeological deposits, representing continued activity in this part of the site throughout the main phases of Al Zubarah's occupation and subsequent abandonment. Most significantly, it shows that a refortification of the wall took place potentially at the turn of the nineteenth century.

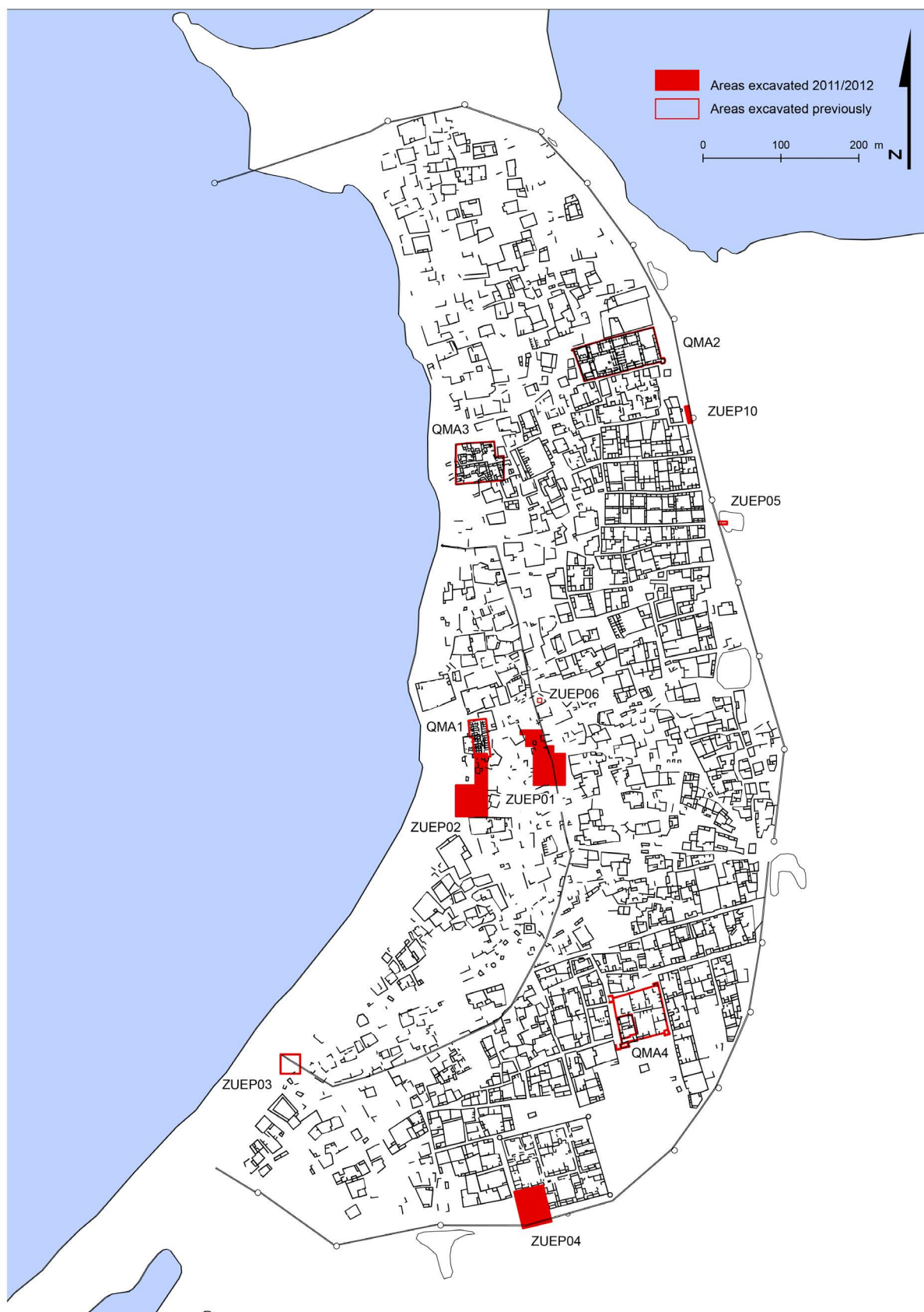


Figure 1.2: Plan of Zubarah showing QMA and ZUEP excavation areas

1.3 ARCHAEOLOGICAL INVESTIGATIONS AT FREIHA IN 2011-2012 (SECTION 3)

Freiha, located four kilometres northeast of Al Zubarah, provided the other main excavation focus this season (locations shown in Figure 3.1). Work concentrated on the domestic structures and adjacent outdoor living areas in FREP04, adding considerably to pre-existing knowledge of the site gained from the earlier excavation of the congregational mosque (See Richter et al. 2011). The 2011-2012 season revealed that the first period of occupation at Freiha was extensive, which is significant given that this phase is likely to predate the foundation of Al Zubarah. The excavations uncovered a complex occupation sequence, with post-built structures, succeeded by new constructions in pisé and mud-brick, which were eventually replaced by stone buildings.

1.4 ARCHAEOLOGICAL INVESTIGATIONS AT FUWAIRIT (SECTION 4)

The QIAH project continued to assist the QMA in defining and protecting the archaeological heritage of northern Qatar. As part of this, in early 2012, excavation took place at Fuwairit, a site on the northeastern coast closely associated with the history of the ruling Al Thani family (locations shown in Figure 4.1). Work focused on recording the archaeology revealed in a series of small interventions along the western edge of the main settlement. This saw the investigation of the large building which proved to be a principal town mosque, and the documentation and sampling of a stratigraphic sequence through one of several large middens. An extraordinarily rich material culture was collected during the excavations, with a particular preponderance of marine fauna.

1.5 MAPPING AND SURVEY IN THE AZAS BUFFER ZONE AND NORTHERN QATAR (SECTION 5)

A major aim of archaeological work in 2011-2012 was the geodesic survey and mapping of key sites in the Al Zubarah Archaeological Site (AZAS) UNESCO buffer zone, ensuring compliance with the UNESCO Management Plan that deals with the regulation of tourism and visitor access to AZAS (indicated in Figure 1.1). In addition to this, an extensive programme investigated in greater detail the QIAH survey area in northern Qatar (area indicated in grey in Figure 1.1). The main results of mapping and investigation of buffer zone sites included the recognition of early Islamic occupation at Ain Mohammad, and a greater understanding of the three settlement areas of Musaikah documented this season, showing it to be an early Islamic archaeological site of major importance, at least as large in extent and architectural complexity as the better known Murwab. In the southern portion of the buffer zone, Helwan and Muhayriqat revealed early Islamic and pre-modern occupation. Muhayriqat is unique in that it incorporates major field systems and agricultural and horticultural remains; significant for understanding the economy and subsistence strategies of Al Zubarah itself.

Ground survey was an integral component of the project work this season, in the face of quickening development in the region, as defining archaeological sites and features in the landscape is necessary before they can be effectively managed and protected. This season the ground-truthing of Birmingham Unit's QNHER survey results was completed, while new survey saw the identification of many previously unknown sites. Critically, the work led to a major expansion in our understanding of the Early Islamic settlement horizon in the Qatar peninsular. In addition it encompassed the detailed mapping of petroglyphs in Jabal Fuwairit (see Eddisford 2012b), and at the later Islamic site of Marrouneh on the east coast, threatened and indeed mostly destroyed by recent development activities.

1.6 FINDS AND CONSERVATION (SECTION 6)

In an archaeological operation as wide-ranging as QIAH, the effective management of finds and data are critical. An introduction to the principal activities undertaken by the finds team is presented here, along with a short exposé on finds conservation work undertaken by the specialist team working at the Al Zubarah Research Station. This work has played a primary role in informing the National Museum of Qatar's planned exhibitions which are scheduled to contain a significant component relating to Al Zubarah and the other archaeological sites investigated by QIAH.

1.7 ARCHIVAL MATERIAL RELATED TO LATER ISLAMIC AL ZUBARAH (SECTION 7)

Alongside archaeology, the investigation of historical sources is of major importance in building up a detailed picture of the past of northern Qatar. In this section, Hanne Nymann provides an overview of the major documentary source materials and archival collections available providing access to the Later Islamic history of Al Zubarah.

1.8 SPECIALIST REPORTS (APPENDICES)

A range of specialists have contributed their expertise to the QIAH project. Appended to this End of Season report are two reports dealing more closely with specific analyses carried out by members of the QIAH team in 2011-2012. These are Dr. Philip Macumber's study of the impact of environmental disparity on human occupation in the Qatar peninsula, and Dr. Lisa Yeoman's analysis of marine faunal material from the excavations at Al Zubarah. A list of further publications and reports is included.



Figure 1.3: Fish mandible from Lisa Yeomans' typological series

2. EXCAVATIONS IN AL ZUBARAH

2.1 AL ZUBARAH EXCAVATION POINT 1 (ZUEP01)

Lisa Yeomans

2.1.1 Introduction

Excavations in ZUEP01 during the 2011-2012 season focused on providing a large exposure of the Phase 6 occupation with the intention of highlighting the density of features from this phase. To expose an area of the Phase 6 archaeology, whilst leaving complete Phase 5 courtyard houses for future display, this season's work was limited to the area of Compound 4 and the area to the north (Figure 2.1). The excavation area was extended to the northwest, thereby fully revealing the partially exposed Space 188. The full excavation of the southern part of Compound 4 south revealed an extensive number of Phase 6 features resulting from repeated occupation. These include large rubbish pits, tannurs, hearths and postholes, with many of the features intercutting one another. The density was such that it was impossible to excavate all of the features and priority was given to pits rich in cultural material, intercutting sequences providing stratigraphic dating and features where C14 samples could be taken.

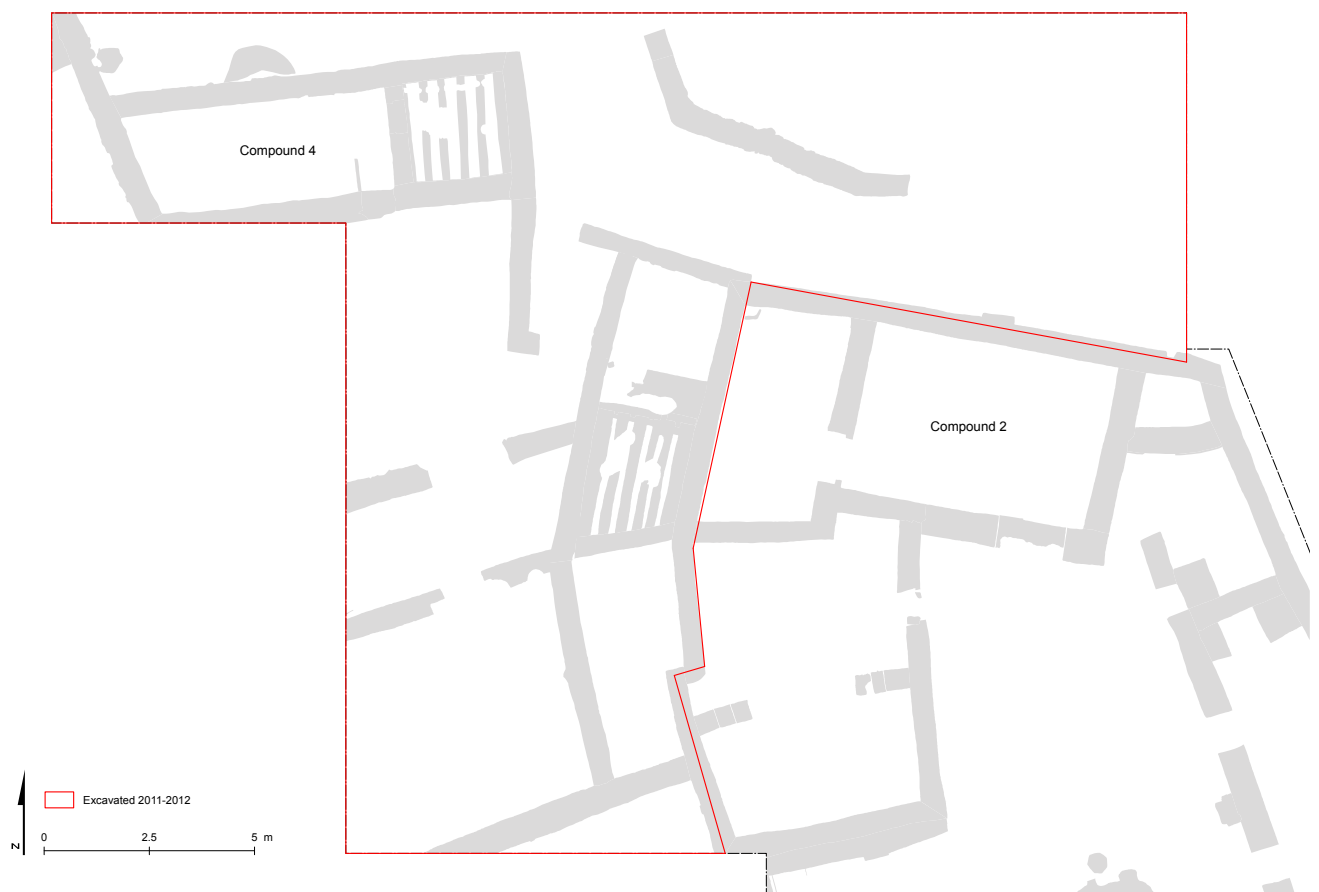


Figure 2.1: Extent of area covered by 2011-2012 season (bounded by red line)

The Phase 6 features provide evidence for the occupation of Al Zubarah either before the arrival of the 'Utub or possibly during their initial occupation prior to the layout of the town with extensive architecture. Archaeological evidence from Phase 6 provides us with physical remains of this period in the early development of the town and, although less impressive visually than the Phase 5 architecture, is very important for understanding of the expansion of the town.

2.1.2 Phase 6 Occupation in ZUEP01

Phase 5 architecture was built on a layer of mixed sand and cultural material. During the 2010 to 2011 season, this sand was exposed below the southern end of Compound 4 and below parts of Compound 2. This season a much larger horizontal exposure of the Phase 6 features was detected and selectively excavated. Many of the postholes contained a single fill that was relatively sterile in material culture, and minimal information would be gained by excavating all of these. Instead, the focus was on excavating the pits containing abundant pottery and faunal assemblages, as well as the hearth and tannurs which would provide environmental evidence.

The density of the features was exceptionally high resulting from repeated occupation in tents or palm frond ('arish) structures constructed from wooden poles with bound date palm branches. Discerning a pattern to the high density of features is difficult. The postholes with burnt fills tended to be amongst the latest stratigraphically and some spatial patterning is evident (Figure 2.2), with these generally occurring on a northeast to southwest aligned strip within the excavation area. The density of unburnt postholes was also higher in this area, whilst the large rubbish pits are generally located to the northwest of this zone. Tannurs and hearth/firepits tended to cluster into groups, probably representing the use of the same part of a structure as a cooking area over time. Most of these concentrations occurred in the same northeast to southwest aligned area as the postholes. This spatial evidence suggests that the repeated occupation in Phase 6 consisted of a row of structures possibly with rubbish pits behind. This may have been a pattern that developed later in Phase 6 and prior to the Phase 5 occupation, when some of the later structures were destroyed by fire, either deliberately or accidentally.

Many of the rubbish pits contained a substantial assemblage of pottery and bone. In one instance, two pots were found stacked upside-down (Figure 2.3). These pots (Figure 2.5) were jars and must have been placed in a pit. An example of one of the hearths is shown in Figure 2.6; this was probably a cooking pit and was surrounded by numerous postholes cutting the natural sand.

2.1.3 Phase 5 Settlement in ZUEP01

Most of the Phase 5 architecture and occupation sequence was excavated in 2010/2011, but additional work was conducted in the extension of the trench to the northwest and, furthermore, Phase 5 deposits were removed to expose those of Phase 6.

Phase 5 Space 189/190 D: Street prior to the construction of Compound 4

The earliest street layers were exposed as continuing under the walls of Space 187 and Space 188, and therefore the street predates the construction of Compound 4. To the north of the street was an open area which had several phases of use as an open cooking site, and an area for tents or other ephemeral structures. In the earliest phase of the use of the space there was no formal wall delimiting the space from the street, and during this time, prior to the construction of Compound 4, the area was used as an external cooking area. Numerous tannurs and hearths were excavated here.

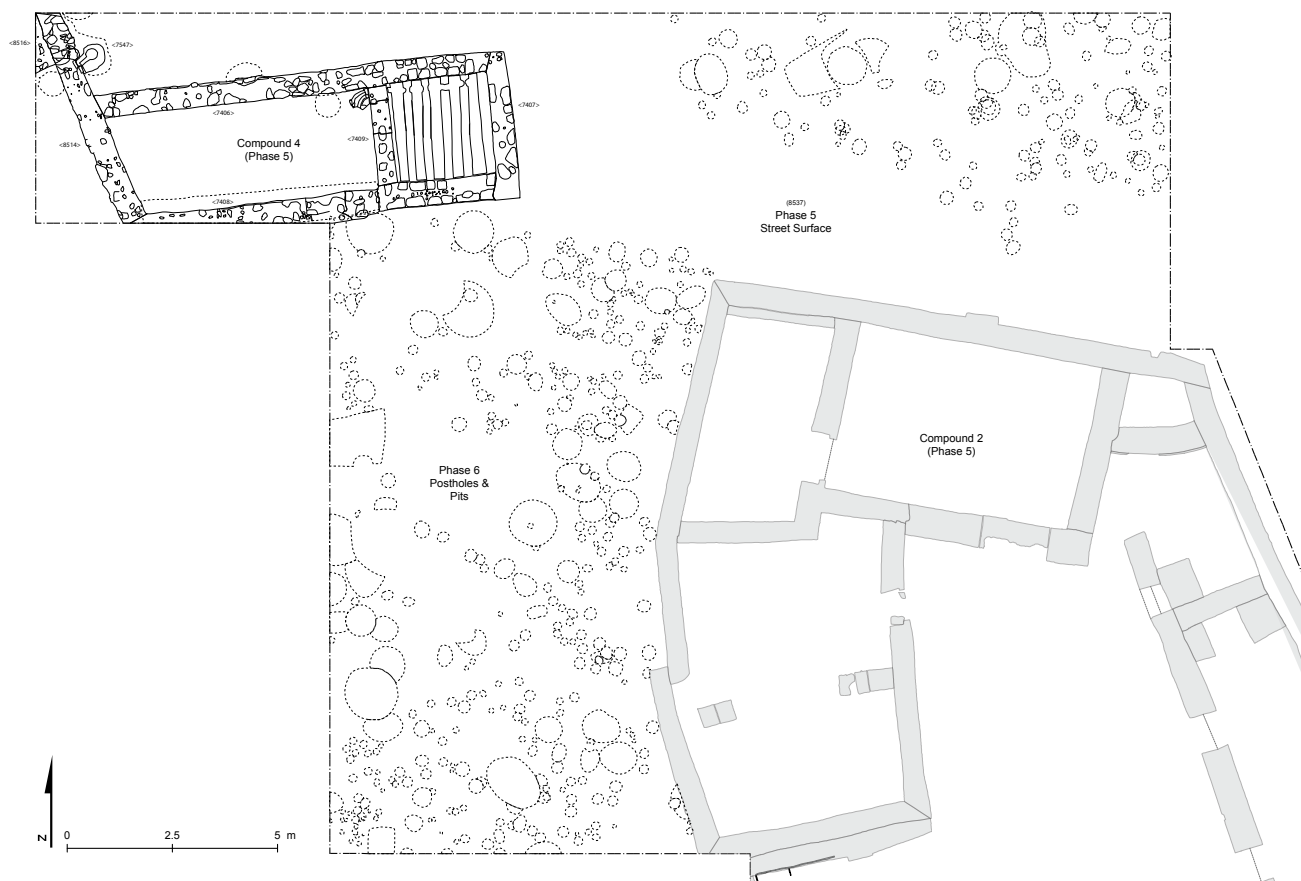


Figure 2.2: Phase 6 features showing burnt postholes, postholes, pits, tannurs and hearths

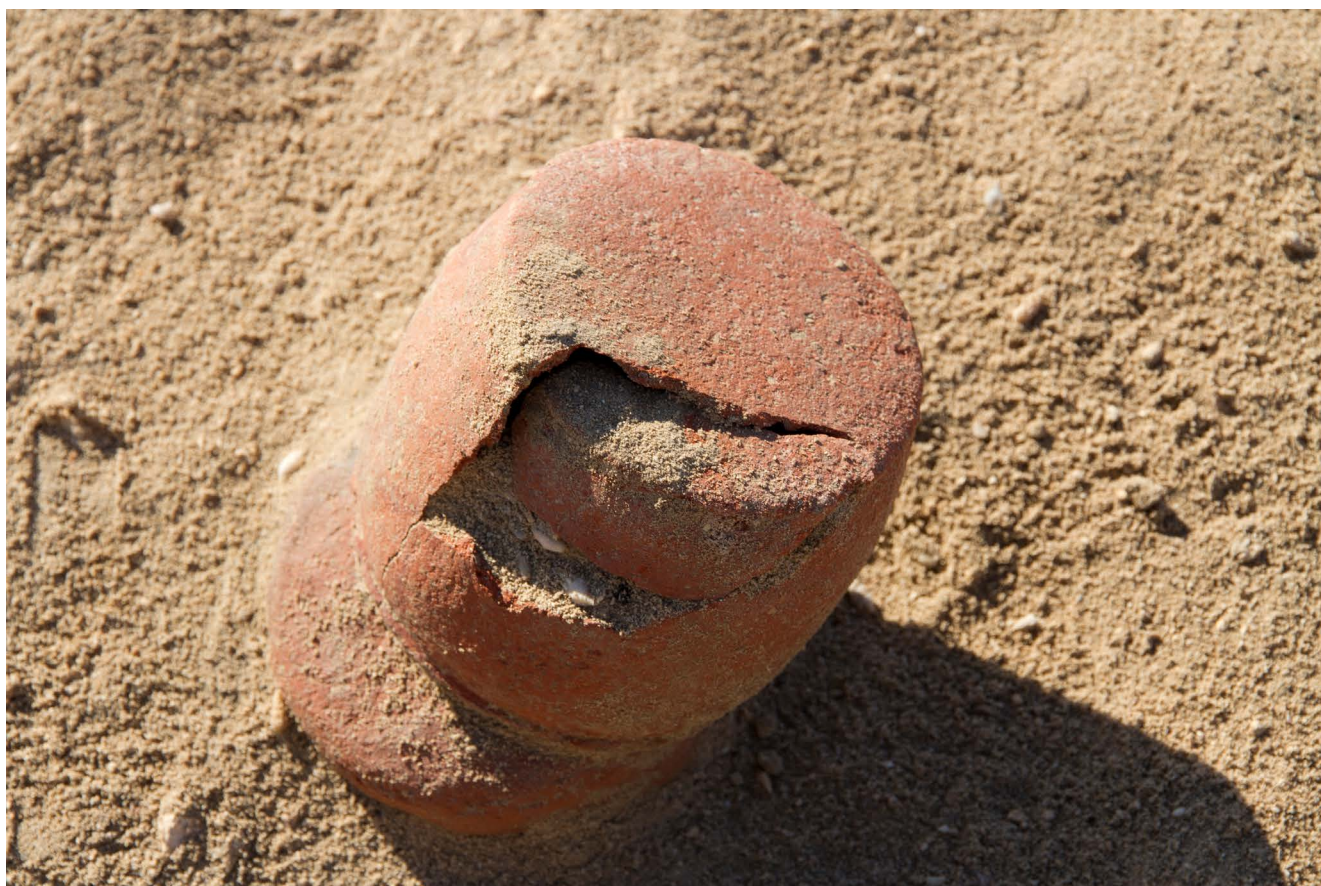


Figure 2.3: Stacked pots found in ZUEP01

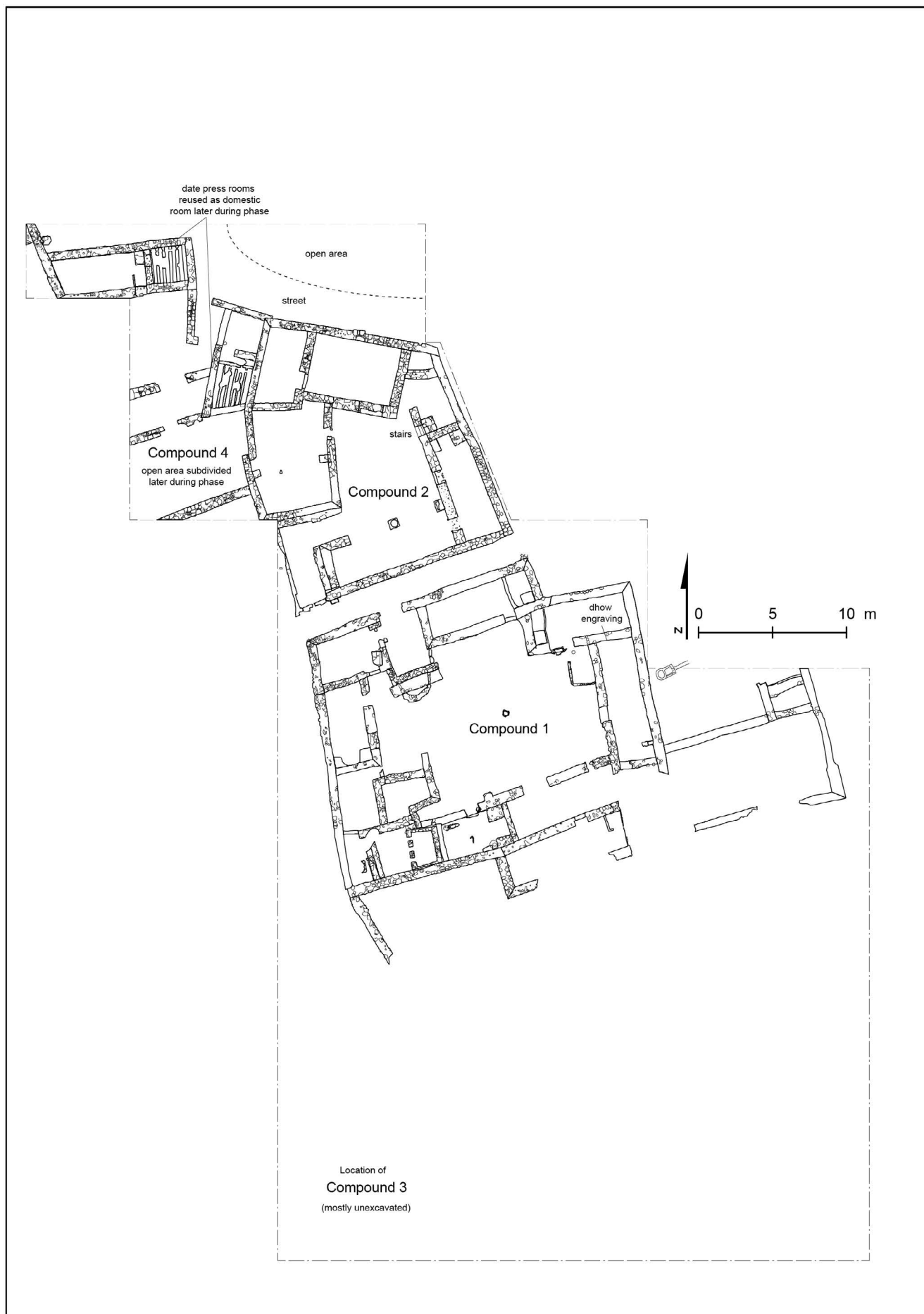


Figure 2.4: ZUEP01 - Phase 5, Compound 3

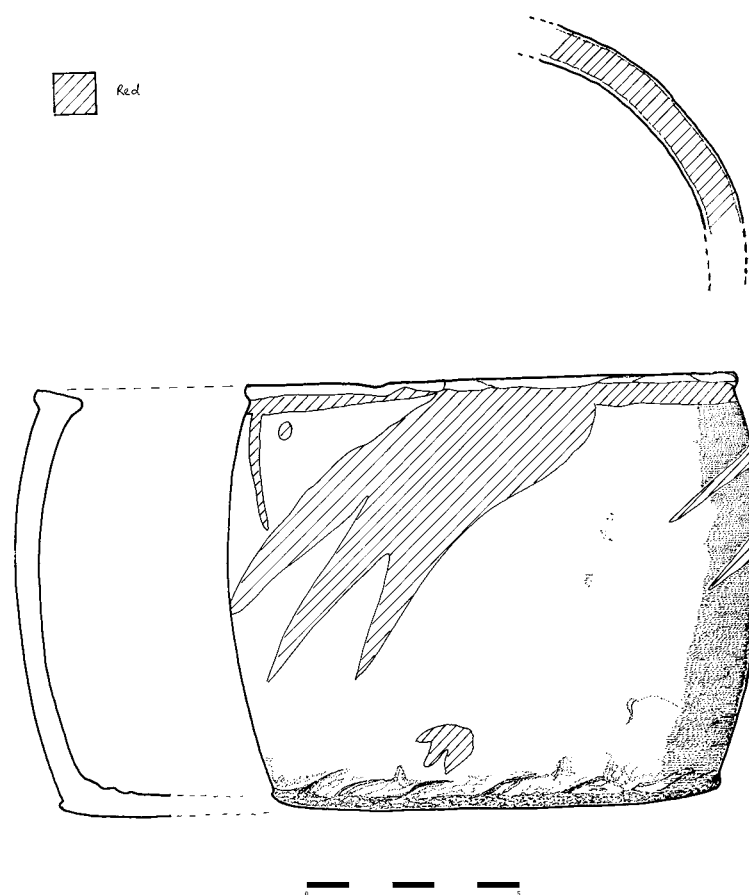


Figure 2.5: Illustration of cooking pot from Locus 7574 (Pot Ref 55)



Figure 2.6: Hearth surrounded by post holes in ZUEP01



Figure 2.7: Doorway leading to Space 187



Figure 2.8: Postholes interpreted as temporary support posts

Phase 5 Compound 4 F: Construction

Compound 4 was mostly excavated in the 2011/2012 season with the excavation area located so that only the eastern side of the compound is visible. In its earliest phase this complex appears to have been a specialised date storage and date syrup production unit. The compound comprised of a southern open space (Space 197), a small multi-function room (Space 195), two further open areas divided by a north-south wall (Space 196 and Space 193), with Space 193 leading into a date press room Space 192. To the north of the compound another date press room (Space 187) was accessed through Space 188. Description of the rooms and the deposits excavated within are given in the 2010-2011 End of Season Report. Space 188, not fully exposed last season, measures 6.40m by 2.35m. The western wall of the room is at an oblique angle to the other walls so that the northern side of the room is slightly longer than the southern side. The internal walls of Space 188 are plastered, and a stepped and plastered doorway was built into the eastern end of the southern wall. To the west of Space 188 is a partially exposed room Space 199, which was only seen in a small area within the excavations, and it remains uncertain if this was part of Compound 4 or part of an adjacent compound. The western wall of Space 188 is aligned at right angles to the orientation of the southern wall of the compound, and it is possible that Space 199 was one of a series of rooms which had their long axes forming the western side of the compound. Space 188 functioned as a date syrup collection area, and probably a storage room, with a doorway leading to Space 187 (Figure 2.7). The placement of the plastered doorway between the two rooms seems strange, as the collection pit is located immediately in front of the doorway. However, the collection pit would usually be covered with a wooden lid that could be walked on, enabling easy access into the date press room.

Phase 5 Space 189/190 C: Occupation

Two postholes parallel to the eastern wall of Space 187 were cut into the street. Their position would have blocked the entrance into Compound 4, and very few other cut features have been found within the street. These postholes are therefore interpreted as temporary support posts used during the construction of the date press (Figure 2.8). Occupation debris and street surface built up, sealing these two features, and the excavation of these deposits yielded substantial quantities of bone, pottery and numerous coins. In this phase the wall delimiting Space 190 from the street was constructed, and a surface was laid down to respect this wall.

Phase 5 Compound 4 B: Change in function to domestic compound

Compound 4 was extensively remodelled in this phase and turned into a domestic courtyard house. Both date presses went out of use, Space 195 was knocked down, the southern wall of Space 192 was realigned and three additional rooms were constructed. A full description of the archaeological sequence is given in last year's report. In Space 187 a shell surface was laid over the date press, and Space 188 was converted into a latrine. At this stage the southern wall of the two spaces was partially knocked down, allowing the drains for the latrine to be inserted. The southern wall of Space 187 was removed to the height of the courtyard deposits. These had built up with the blocking of the doorway from Space 188. The date collection pit was infilled and a sand levelling layer was spread across the room. Within this layer a miniature ivory pot measuring just a couple of centimetres in size was recovered complete with its lid (Figure 2.9).

In the area where the date collection pit was located, a plastered wash basin was built. In the southeast corner of the room the latrine and a screening wall were constructed. The plastered surface of the latrine sloped to the south where it fed into a gypsum plaster pipe draining into a stone-lined cess pit located in the central courtyard (Figure 2.10).

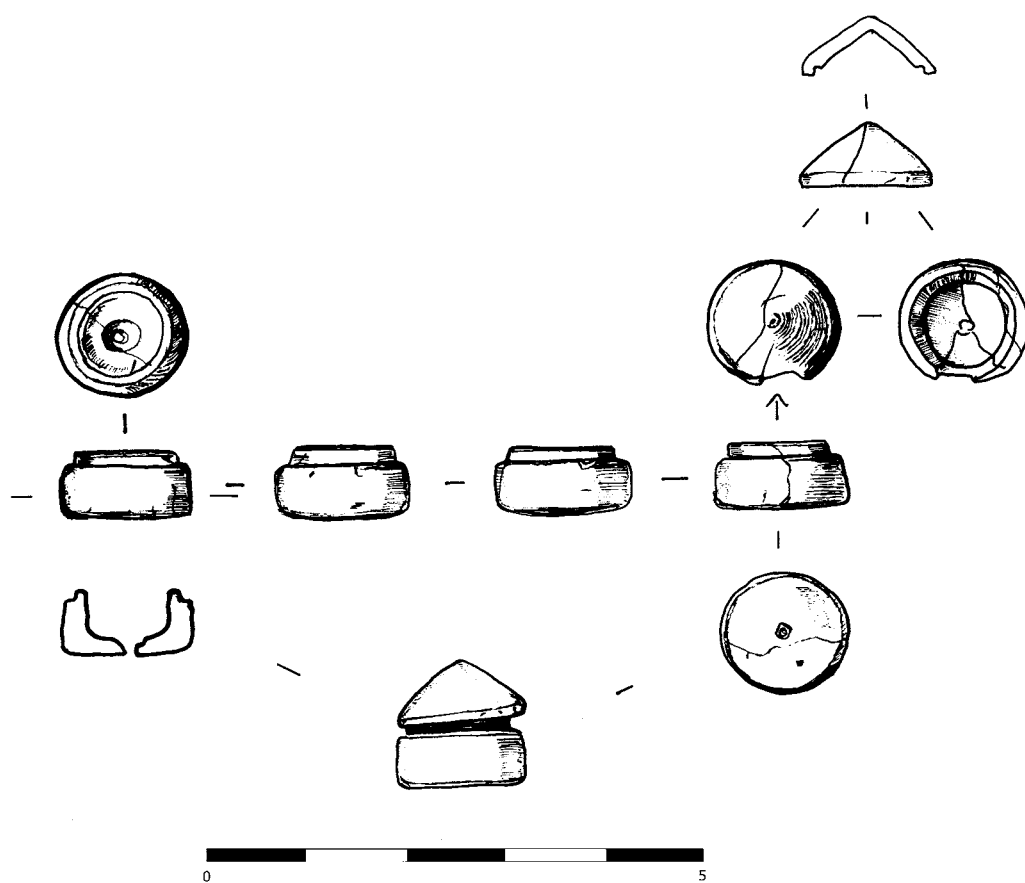


Figure 2.9: Miniature ivory pot with lid (Locus 7540, Cat.1114)



Figure 2.10: Plaster lined drain and latrine in central courtyard of ZUEP01



Figure 2.11: Channel leading to drain in ZUEP01

Phase 5 Compound 4 A: Change in layout of domestic unit

In this phase the layout of the courtyard house was modified slightly, with Space 192 extended to the north and the room divided into two by a narrow partition wall. There were no associated changes within Space 188: this room continues to function as a latrine until the abandonment of the house. In Space 199 a spread of ceramic sherds lying on the surface probably represent a complete vessel left at the abandonment of the building, and subsequently broken by the collapse of the architecture.

Phase 5 Space 189/190 B: Occupation

Most of the deposits from this phase were excavated in 2010/2011. Based on the levels of the street deposits excavated last season and those from the extension of the trench to the west, two deposits have been assigned to this phase. Both layers were laminated sequences of occupation debris and laid deposits.

Phase 5 Space 189/190 A: Occupation

Further laminated street layers were assigned to this phase. At the western end of the exposed street the surface was truncated by a drain. This was lined with beach stones with sandy silt and areas of gypsum plaster used as mortar. The drain was capped with two flat stones covered and sealed with gypsum plaster. This plaster was also applied to wall and moulded into a recess in the wall to form a channel leading into the drain (Figure 2.11).

2.1.4 Conclusion and recommendations for further work

The excavated sequence in ZUEP01 provides a comprehensive sample of the Phase 6 settlement in this part of the site, as well as the occupation of two complete courtyard houses from Phase 5. The excavated sequence also provides evidence from a specialised date production facility and its eventual change into a domestic house. Parts of additional structures have also been excavated, and there is evidence for the layout and maintenance of a street. In the 2011 to 2012 season excavation work focused on providing a large sample of the Phase 6 occupation, showing that this phase of the occupation of the site is represented by tents and/or palm frond structures. The numerous postholes and the intercutting features show that this occupation witnessed numerous rebuilds and repairs to the structures. Spatial patterning suggests that, perhaps towards the end of this occupation, the structures were orientated in a northeast to southwest alignment with rubbish pits to the northwest. Burning of some structures may have occurred towards the end of the Phase 6 occupation. Preliminary analysis of the pottery from some of the rubbish pit suggests that there are some earlier pottery forms as well as the pottery types that are found in Phase 5.

No further fieldwork is recommended for ZUEP01, barring post-excavation analysis. A comprehensive stratigraphic report tying together the work from the four excavation seasons needs to be produced, and this would form the basis for future publication. Analysis of the material excavated from ZUEP01, perhaps focusing on specific research questions to date and understand the occupation sequence of the area, should be a priority. The stratigraphic sequence from ZUEP01 provides evidence to examine the initial occupation of the town and economy as the settlement developed. Additionally, the courtyard houses provide evidence of activities at the household level.

2.2 AL ZUBARAH EXCAVATION POINT 2 (ZUEP02)

Michael House

2.2.1 Introduction

Al Zubarah Excavation Point 2 (ZUEP02) is located inside the inner town wall, slightly to the north of centre overlooking the beach, 50m southeast of the QMA excavations of the area identified as a suq. Last season's work saw a link, the Northern Extension, inserted between the suq excavations and the main open area excavations in ZUEP02. Excavations over the previous two seasons had identified a Phase 3 domestic compound similar in its piecemeal development to the compound in the main excavation area to the south. A continuation of the Phase 5 suq to the north (Figure 1.2) is currently being uncovered. The Phase 3 suq appears to have been smaller, reflecting the economic downturn directly related to the settlement shrinkage to the inner town wall identified in excavations at ZUEP01 (Figure 2.12).

Within the main excavation area to the west, the goal this season was to remove the remaining Phase 3 material and understand the complicated development of this large domestic compound, based mainly on the two distinct sub-phases of the central courtyard development. In the east



Figure 2.12: ZUEP02 Phase 5 Suq (North to right of image)

of the main excavation area, this season has seen the removal of the final Phase 4 material, most notably the madbasa (Space 11), giving greater exposure of the Phase 5 compound plan layout. The removal of the fills of several of these Phase 5 rooms and spaces has truly defined the compound's function first and foremost as a storage facility with a secondary function of production, indicated by the presence of three date storage rooms and the smaller spaces associated with collection of the syrup.

Fieldwork this season was a direct continuation of the work conducted over the last three seasons, and as a result most of the aims remained the same; that is, getting a better understanding of the area and its function (either static or changing) throughout the development of Al Zubarah.

2.2.2 Phase 5 - Plastered Beach & Limestone Architecture

This is the first of two major architectural phases identified at Al Zubarah, consisting of well-constructed walls of beach rock and limestone with fine hard plaster on the walls and many of the surfaces. This phase clearly demonstrates pre-determined town planning, and evidence of a well-established hierarchy. Within the excavation area, this phase is represented architecturally by two large courtyard compounds separated by a street (Space 03), and within the northern extension by a possible continuation of the suq or khan (Figure 2.13). The architecture is generally on an east to west alignment unlike architecture in the later Phase 3.

Western Excavation Area

In the western area one intriguing structure was exposed this season, located below where the Phase 3 room stood. This beach front structure appears to be separated from the main Phase 5 compound (eastern area) by a north-south aligned street 5.80m wide. The exposed extant structure measures 9.30m x 4.50m and appears to consist of at least two distinct spaces and a possible stair-well allowing access to the roof of an adjacent long, narrow (1.50m wide) room (Figure 2.14). The stairwell appears to have been accessed to the south from an external space or courtyard. No steps survive, but the stair-well is packed with stone - possibly a core for the stairs. If it functioned as a corridor, it leads nowhere, and is plastered on the northern face where the entrance to the adjacent room lies. The minimal exposure of this space has thrown up many questions regarding its function, and despite the poor survival, it appears very different to any structures we have found in ZUEP02 to date.

The only excavated material from Phase 5 this season in the Western Area was a small spread of broken ceramics mixed with ash, deposited on a corridor floor surface located to the west of the possible stair structure. The deposit also contained small quantities of fish bone and burnt shell, and is likely a cooking waste dump deposited at the time of abandonment.

Eastern Excavation Area

Almost all of the Phase 5 architecture exposed to date appears to be associated with two courtyard compounds bounded by two parallel streets (Spaces 03 & 28) aligned on an east to west axis, running towards the sea from the town walls. Part of the first compound was excavated in the 2009/2010 season: it consisted of six rooms, located to the north of road Space 03, with more of this compound sealed below unexcavated deposits in the Northern Extension and the unexcavated area to the east (see Figure 2.13).

The second large compound is formed of at least twenty-four extant Spaces, and like the first continues beyond the eastern limit of excavation. The compound is constructed around a central courtyard, with a second entrance courtyard to the west, enclosed on three sides and apparently open to a possible street to the west. This compound had three date processing

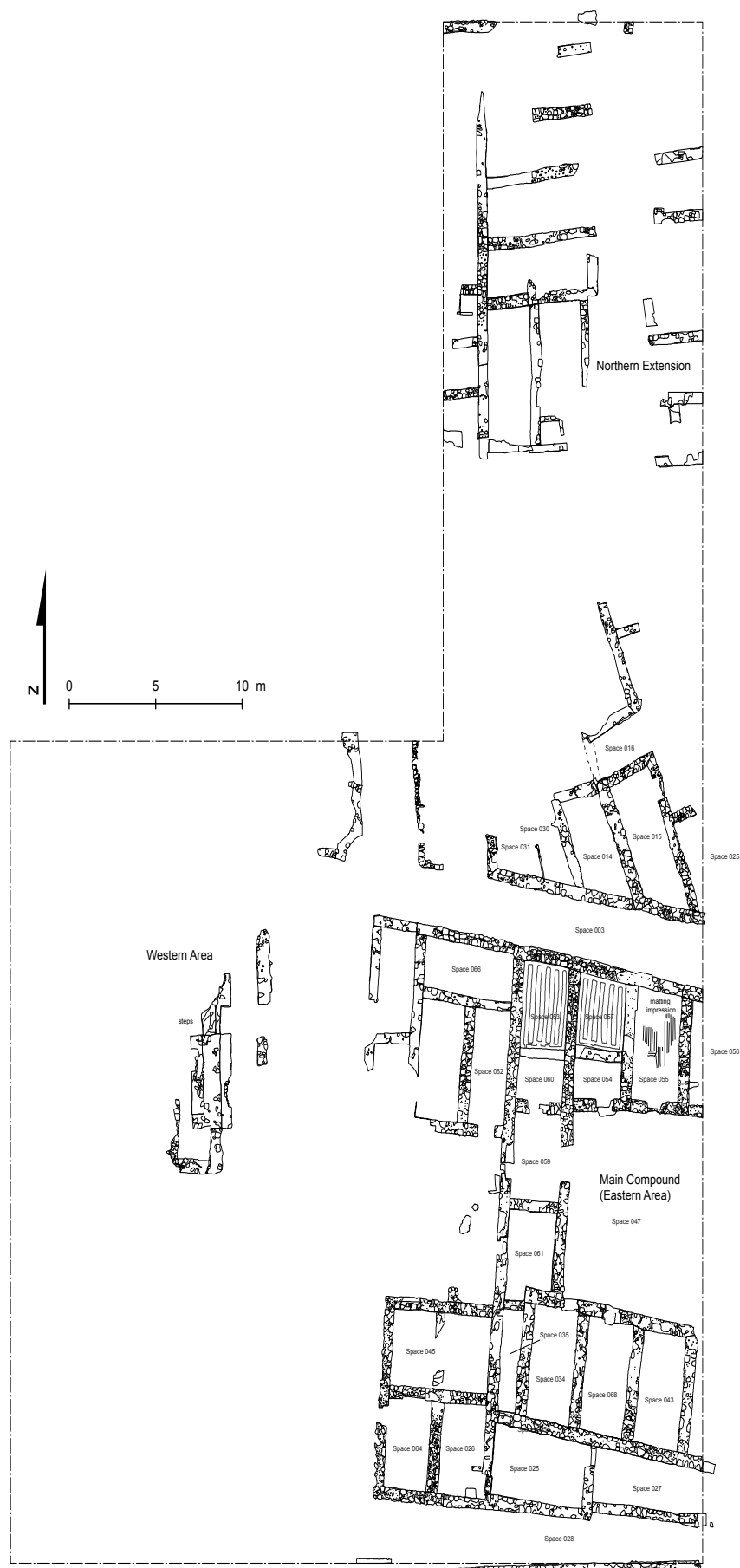


Figure 2.13: ZUEP02 Plan of Phase 5 Architecture



Figure 2.14: Beach front structure ZUEP02 - Western Excavation Area (North to top of image)

rooms (madbasa), each formed of two separate spaces and one containing the ridged plastered pressing channels divided by a low plastered wall from a smaller catchment room with a small pit designed to house a ceramic vessel to catch the syrup drained from the adjacent space (Figure 2.15).

The presence of these three large madbasas demonstrate that the function of the compound appears to be related to storage and production, rather than being a domestic compound, and likely has a direct link to the khan or suq located further to the north (QMA1). This is reinforced by the presence of several large storage vessels found as *in situ* abandonment deposits on the surfaces several of several spaces during all excavation seasons.

Located between two of these date processing rooms was a room of equal dimensions, the beaten earth floor/surface in a mix of sand and ash giving it a mid grey hue. Above this at the centre of the room was a combination of matting and matting impression formed in the vitrified (cemented) orange material (also found in other spaces in the excavation area). The matting covered an area 2.30m x 2.00m located roughly at the centre of the space, and the herringbone weave is clearly visible in the preserved remains (Figure 2.16).



Figure 2.15: ZUEP02 Madbassa and detail of catchment pit



Figure 2.16: Remains of matting in ZUEP02

Construction of the main compound occurs radially around the central courtyard. Access within the compound was restricted, with all of these spaces only accessible from the courtyard once access had been gained through the main western entrance hall (Space 59 - Figure 2.17). Later construction in the compound came in the form of two square additional wings abutting the extant western wall. The southern wing consisted of three spaces, a layout mirrored in the northern wing, however later still the northern wing was extended further to the west with at least two more spaces added and as yet unexcavated (see Figure 2.13).

In the Northern Extension

The removal of all of the Phase 3 architecture and some of the intermediate Phase 4 deposits has allowed a glimpse of the Phase 5 layout. At least 15 rooms/spaces are identifiable, laid out in two parallel north-south aligned groups, all or most appearing to have the hard grey plaster on the walls indicative of the Phase 5 architecture. The rooms include at least two ablution rooms, small cell like structures separated from the main room with thin plastered screen walls. At present the full plan is not completely exposed (Figure 2.13).

Phase 5c - Post Occupation Abandonment and Demolition

This phase was represented by a series of large deposits filling the rooms and spaces discussed above (Phase 5a and Phase 5b). These deposits vary slightly: some are reminiscent of slow periods of degradation and decay whilst others seem more in keeping with systematic demolition and infilling, and not all the spaces have the same depositional sequence even between adjacent rooms. Most of the sequences end with a deposit of windblown sands filling the hollows formed at the centre of the rooms and spaces created by the demolition/collapse process. Several of the rooms contained articulated adult cat skeletons as *in situ* abandonment deposits on the floors or surfaces, most likely indicative of that space's abandonment prior to collapse.



Figure 2.17: Entrance hall (Sp. 59) with ceramic spread and detail of preserved bitumen door frame

2.2.3 Phase 4 - Open Area Spaces 51 & 65

An intermediate phase, Phase 4, is constituted by a large open area with little or no stone architecture, but with a great deal of activity. Cut into the shell and sand surfaces were many tannurs, fire pits, post and driven stake holes. This is most likely indicative of temporary seasonal camps between the major architectural phases. The plan shows the distribution of features, which are present in numerous sub-phases (Figure 2.18).

Western Excavation Area

The earliest excavated deposit in the western area this season was the upper portion of aeolian sands filling the hollow between in the large eastern Phase 5 compound and the newly discovered phase 5 beach front structure in the Western Area (discussed above). The sand covered a substantial area (27.50m north-south x 12m E-W x 0.05 – 0.10m thick) but was mainly located above a space believed to be a north-south aligned street. The deposit links in with the eastern excavation area via rubble and plaster deposit which partly covered the sands. Dug into the sand were a series of cut features, mainly fire installations related to cooking, a couple of postholes and some irregular pitting likely associated with robbing of the phase 5 stone.

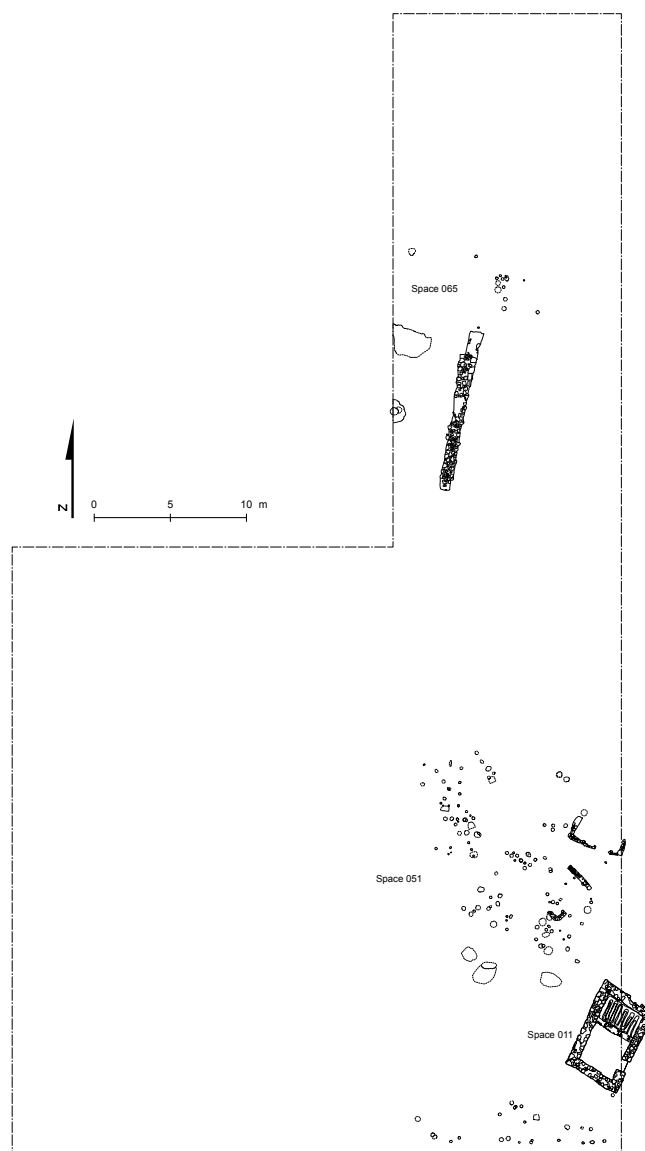


Figure 2.18: ZUEP02 Phase 4

Eastern Excavation Area

Most of the Phase 4 deposits and the numerous cut features within these deposits have been systematically excavated over the last two seasons in the eastern area, leaving just a few remnant surface patches overlaying the demolition/collapse infill of the Phase 5 architecture below. The only stone structure present in this phase (the date processing room, Space 11) came into play later in sub-Phase 4b or c. This was removed this season exposing more of the Phase 5 layout below.

Northern Extension (open area Space 65)

This phase similarly consists of a series of surfacing events cut by numerous postholes, fire pits and tannurs. It represents a period of temporary settlement between the two major architectural phases, and like the excavations to the south, this open area has very little evidence of stone built structures. One of the expansive Phase 4 surfaces excavated this season was noteworthy, an occupation accumulation/surface rich in finds with numerous ceramics and iron objects, shell, animal bone, and ash, with occasional glass and copper alloy objects. Finds of note included two coins; two stone sling shots or musket balls; a copper alloy ring; a glass bead; an iron and copper alloy locking mechanism; a porcelain kohl bottle and a blue porcelain dragon dog (temple guardian) figurine broken from the top/lid of a porcelain vessel (Figure 2.19). This surface also functions as the construction horizon for the earliest Phase 3 building (Space 37).

2.2.4 Phase 3 – Later Architectural Phase

This second major architectural phase consists of two large courtyard compound enclosures and their associated out-buildings, one in the main excavation area and a second identified last season in the Northern Extension. This second compound, like the first, developed with several rooms finally being drawn together with an enclosing outer wall forming a central open courtyard. These rooms all appear to have had domestic function (Phase 3 plan – Figure 2.20).

The walls of these structures are generally rough beach-stone walls with selective mortar render, but generally poorly finished. Many of the structures within this phase showed evidence of major fire damage prior to abandonment. Some of the structures appear to have lived on for a short time after, but generally speaking, they seem to represent the end of this phase.

Western Excavation Area

A main drive of our work in the Western Area this season was to remove the remnants of the Phase 3 architecture in order to gain a greater understanding of the main courtyard development. This development can be split into two broad sub phases based directly on changes made to the courtyard space. The first of these, Sub-Phase 3a, is centred on the earlier courtyard Space 49. This early enclosure appeared to have developed around two existing rooms and, based on the amount of associated surfacing events, appears quite short lived.

Later in Sub-Phase 03b the eastern boundary wall of the courtyard Space 49 was removed (Figure 2.21) and the courtyard compound expanded to the east to incorporate Space 02 (Figure 2.22), which was structurally similar in construction and thus likely contemporary with Space 07 & 09. This new larger courtyard compound (Space 50) appears directly linked to several other structural adjustments including; the enclosing and formation of Space 008 to the north. Some minor structural changes occur, such as the insertion of air vents in the western wall of Space 010 and the blocking of entrances or through spaces. The construction of the large rectangular southern enclosure Space 05 (and its internal division in the form of Spaces 04 and 06) appears to have occurred a short time after the construction of the larger courtyard Space 50.



Figure 2.19: Blue porcelain dragon dog (temple guardian) figurine broken from the top/lid of a porcelain vessel.

Both sub-phases can be linked to external activity to the southeast, and both courtyards were the focus of domestic activity in the form of tannurs and their associated charcoal pits, postholes and larger stone lined pits cut for storage (Figure 2.23).

Northern extension

This has very complex stratigraphy owing to the very fluid nature of the Phase 3 development. New rooms and spaces were constructed that often encroached and changed the form of existing spaces, in particular the open courtyard (Space 42). Like the Phase 3 structures in the main excavation area, the structures in the Northern Extension developed in a piece-meal or ad hoc fashion unlike the formal structured layout seen in the Phase 5 architecture.

The Phase 3 buildings are still aligned roughly north-south, but with less regularity to their forms, and several are more on a NNE-SSW axis. The walls are constructed predominantly with angular beach stone and beach stone conglomerate, with occasional more exotic stone like dolomite and gypsum particularly around possible entrances and in thresholds.

All eight of the spaces and or rooms identified form a single complex enclosed with boundary walls forming a courtyard Space 42. The western limit of the compound falls within the excavation area, however the eastern limit is unknown as the rooms and walls continue to extend beyond the limit of excavation, some below the current location of the spoil heap.

The compound development is best viewed via the development and changes made in and around the form of the central courtyard Space 42, which includes and is linked to the construction of several new rooms - as such it has been divided into five development sub-phases (a-e).

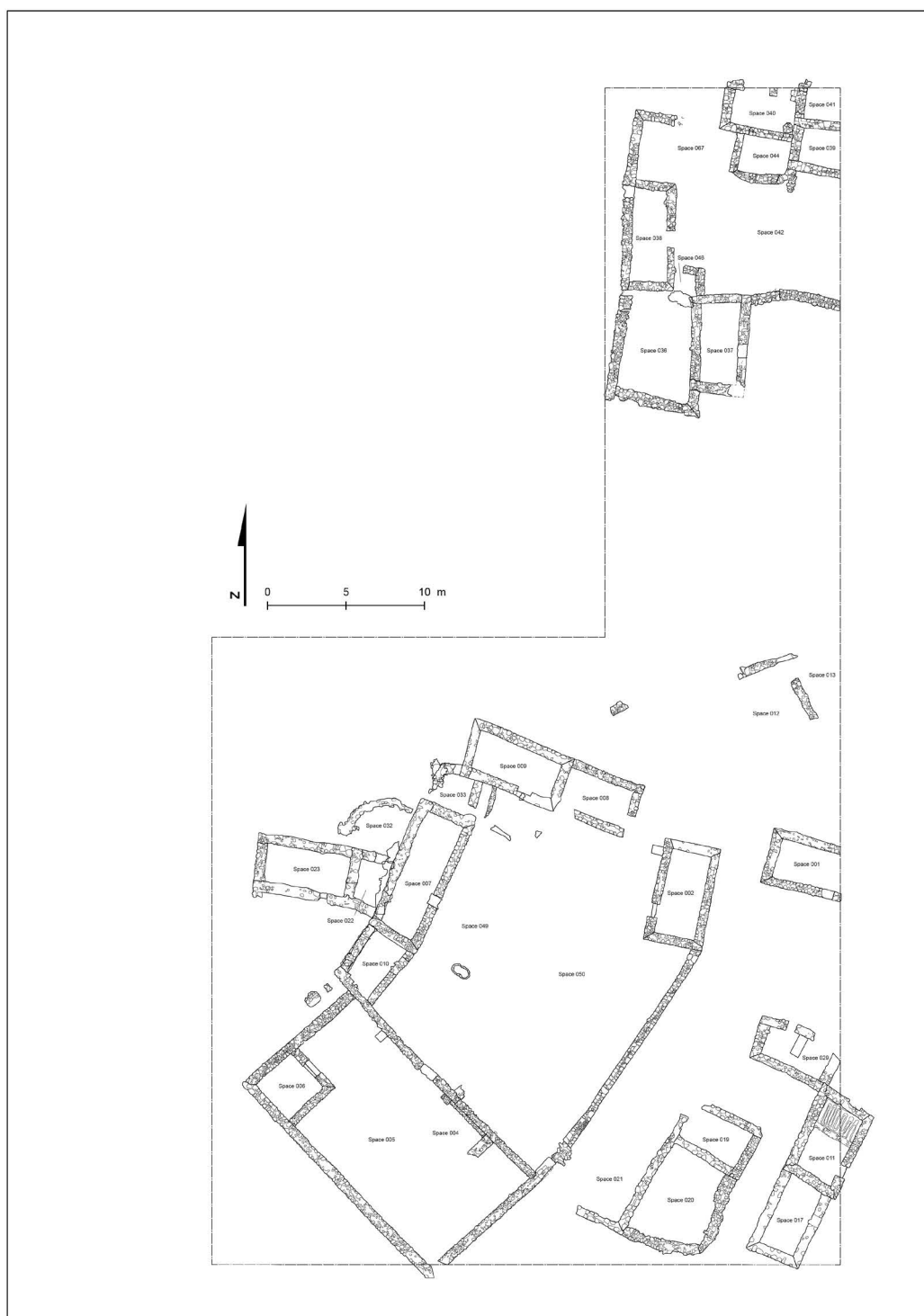


Figure 2.20: Plan of ZUEP02 Phase 3

2.2.5 Conclusions and Recommendation

Future work should focus on the continued exposure and excavation of the soft deposits above the Phase 5 architecture, particularly in the courtyard storage compound where only three to four spaces remain unexcavated, and to gain a better understanding of the newly exposed Phase 5 structure in the Western Area.

In the Northern Extension the goal is to excavate of any Phase 4 material and removal of the fills within the exposed Phase 5 architecture in order to gain a better understanding of the suq, hopefully with some *in situ* floor deposits, and understand the link between the suq and the two southern storage compounds.



Figure 2.21: Looking SW showing the SE corner of courtyard Sp. 49 and demolished eastern wall



Figure 2.22: Eastern courtyard extension wall forming Sp. 50

As noted earlier in this report, the nearby area of ZUEP01 has provided us with an extensive densely packed occupation Phase 6 comprised of a myriad of cut features not dissimilar to Phase 4 in ZUEP02 area. However a Phase 6 equivalent has not yet been seen within the ZUEP02 area and it would be of interest to see if it is represented here and if it has a similar density to that seen in ZUEP01 to the east. This could be done with some targeted trenches within the open spaces, the courtyards and streets providing a stratigraphic view of the depth of surfaces in these spaces as well as looking for earlier phase material culture, providing us with a more complete view of the site development.



Figure 2.23: Stone lined storage pit in courtyard Sp. 50

2.3 ZUBARAH EXCAVATION POINT 4 (ZUEP04)

Tom Collie

2.3.1 Introduction

Excavation Point 4 (ZUEP04) is located at the southern end of Al Zubarah (see Figure 1.2). It focuses on a large compound enclosing rooms and courtyards supported by parameter walls with corner towers. This compound was divided into nine separate areas circumnavigated by streets and passageways (Figure 2.24).

Excavation work in season 2011/12 was extensive, and investigated the majority of the extant archaeology within the south western most compound section (hereafter named Precinct-Section 8, or PS8). It proved that the section was domestic accommodation for a family unit living in Zubarah during its earliest stages of development (see Figure 2.25). Work in season 2011/12 aimed therefore to continue this investigation and centred on three main objectives.

The first objective was to examine remaining deposits and architecture within the central courtyard area and unexcavated Space 3010. The second focused on an area to the north of PS8. The possibility of a northern corridor with an associated entrance to the outside compound area was highlighted from work in season 2010/11. With an extension of the site as a whole directly to the north, excavation therein would link interior deposits and dating evidence to



Figure 2.24: ZUEP04 - Plan showing precincts

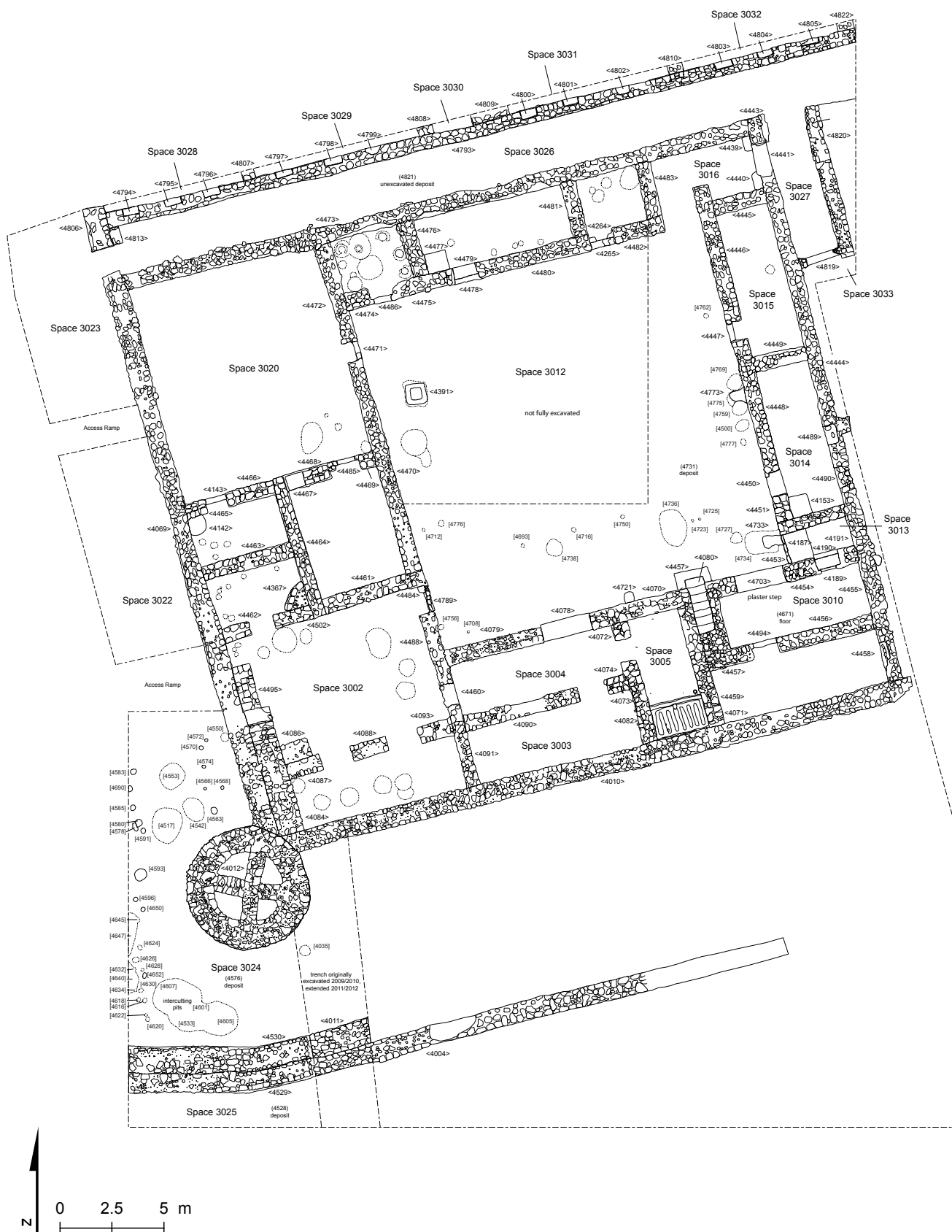


Figure 2.25: ZUEP04 Detailed post-excavation plan

those from the exterior. It would also illuminate methods of communication between compound sections and confirm whether they were linked internally. The third and last objective focused on the exterior area around the tower. Excavation of the south western exterior area would not only reveal the true extent of tower <4012> but also recover vast quantities of material dating evidence from the remaining midden deposits heaped against the architecture.

2.3.2 Objective 1

Space 3010

This small space contained layers of shell and silt forming surface layers that had been in constant use during the compound's occupancy. Most deposits within this room spread north into the south-eastern area of the central courtyard. Whether this was a result of visitations to the ablution Space 3013 or the far southeastern Space 3011 is unknown. Certainly, Space 3010 was a transitional area between the exterior and the interior areas beyond. It is also similar to Space 3004 which shared a similar sequence of shell and occupation spilling out into the central courtyard. These rooms therefore could be classed as transitional spaces, neither exclusively interior nor exterior.



Figure 2.26: ZUEP04 -Drain not corresponding to the compound's original construction

Space 3012

The excavation of Space 3012 was limited to an area focused outside both the southern and eastern wings of the compound (see Figure 2.25). This area stretched approximately 5m from the central courtyard walls and was strategically placed to facilitate the conservation process. Since only the southern and eastern ends of the courtyard were excavated, not all deposits observed and recorded from season 2010/2011 were examined and were therefore left for investigation in future seasons. Deposits within the courtyard were organised into five main sequences, each one representing a main courtyard surface which had been truncated by features such as post holes, soak-aways, simple pits and plastered drains. The presence of these sequences strengthened the idea that the compound was in constant use and underwent modification. This development not only extended to the cleaning of the shell surfaces and their subsequent replacement but also to the improvement of thresholds to Spaces 3002, 3014 and 3015. These sequences strengthened the idea that the ablution block was a later addition to PS8. The excavation of middle to later courtyard sequences demonstrated the existence of a cut that housed a drain not corresponding to the compound's original construction (see Figure 2.26).

Space 3016

In Space 3016, further investigation indicated that the ground surface consisted of compact silt containing small tabular beach stone and weathered beach stone fragments (locus 4664). Excavation clearly displayed that the plaster door-post sockets at the doorway to Space 3016 were built on top of this deposit. It showed that the doorway was itself restored and reconstructed - the beach stone fragments present in the floor surface may have originated from this rebuild. Investigation of the threshold to Space 3016 revealed an earlier feature below the horizontal threshold (see Figure 2.25 and Figure 2.27). It is clear from this evidence that the threshold



Figure 2.27: ZUEP04 - Earlier feature below the threshold



Figure 2.28: ZUEP04 -View of northern area of excavation



Figure 2.29: ZUEP04 - Architectural feature <4813>

was raised by 0.1-0.2m and, consequently, deposit (4664) may have been laid as a means to gradually grade the entrance level down to the courtyard levels. This is yet more evidence that the PS8 went through a series of refurbishments before abandonment.

2.3.3 Objective 2

Corridor Spaces 3026-7

New architectural features were discovered when the excavation was extended approximately 5m to the north (see Figure 2.28). Investigation revealed the presence of an east/west running corridor, Space 3026, linking the interior compound to the exterior via a doorway. Entrance way Space 3016 clearly linked this northern running corridor to Precinct Section 8 (PS8). In the southern end of Space 3027 lay another doorway, probably running into the Precinct Section 1 (PS1) to the east (see Figure 2.24 and Figure 2.25). Clearly, the corridors linked the internal compound to the outside world and, given its position between PS7 and PS1, were key walkways facilitating safe passage between other internal compound subdivisions.

The western end of the corridor is the most intriguing since it contained architectural feature <4813> (see Figure 2.25 and Figure 2.29). This small stone block was built butting both the main northern corridor wall and the exterior western compound wall and together helped form a doorway to the outside. The opening was partially excavated in season 2010/2011 but time constraints last year did not allow for complete excavation. Work here this season confirmed an entrance way to the interior of the compound. The feature was constructed from sandstone, as opposed to the commonly found beach stone, and was rendered with a pink grey plaster. Moreover, the top featured a small narrow rectangular slot, 0.12m wide and 0.15m deep, which was believed to have contained a latch or bar for a door.

Other architectural elements revealed through the initial excavation of Space 3026 were small plaster features set onto the northern face of wall. Plaster features resembled the remnants of vertical frames that ran up the face of the southern corridor wall. They were badly damaged so interpretation was limited, but they may have represented the partial remnants of door frames or bracket-features for down-pipes from the roof.

Spaces 3028-32 in Precinct Section 7

As previously mentioned, the northern corridor wall also formed the southern extent of another discrete compound division, namely Precinct Section 7 (see Figure 2.24). It was butted on its northern side by four walls which formed Spaces 3028 to 3032. These walls were not excavated fully since they lay beyond the limit of excavation but were built from the same standard beach stone found in the other walls of PS8.

Twelve plaster niches were set into the very top of corridor wall <4793>, which were very similar to other plaster features in the structure. Every space in PS7 except Space 3030 contained 3 niches set into the wall. No architecture was discovered to form the northern extent of these rooms since they ran beyond the Limit of Excavation.



Figure 2.30: ZUEP04 - Excavation outside the compound and around tower <4012>



Figure 2.31: ZUEP04 - traces of temporary external structures

2.3.4 Objective 3

Space 3024

Space 3024 extended and amalgamated Space 3001 from season 2009/10 (see Figure 2.30). It focused on deposits and features that lay directly outside the compound and around the southwest tower <4012> of the compound. Deposits and features within Space 3024 were numerous but could be divided into 6 groups which related to order of deposition. The archaeology within this area was dominated by midden dumps which were located mainly in the south. These were piled high around the tower which then sloped and spread towards the north. Many of the post holes found towards the base of construction horizon were also located around and near to the buttress supporting the outer city wall. The northern area did hold some large truncations but the number of features located was small compared to those of the south.

The deposits in Groups 1 to 6, although complex and numerous, were interesting since they displayed the development of Al Zubarah from construction to decline. Groups 1 and 2 showed the initial construction of the building. They hinted at subsequent temporary structures that were erected either to house humans or animals or to be used as construction supports for the erection of the architecture (see Figure 2.31). They revealed that the dumping of midden deposits began almost immediately after the construction of the walls and tower. Additionally, they showed the increased defence of the outer city wall provided by buttressing (see Figure 2.32). Group 3 continued the themes set from the loci stratigraphically below, developing the idea that the area around the tower was a waste-dumping ground while simultaneously illuminating indications of strong temporary structures that lay outside the tower. Group 4 displayed large-scale dumps of material waste but introduced the presence and need for massive pits cut through the stratigraphy perhaps to gain access to the natural shell layers below. It is within this group that the first signs of architectural collapse and dilapidation are seen. Groups 5 and 6 belong to the later stages of Al Zubarah's development. They still contained large amounts of dumped midden deposits as well as later pitting activities but were characterised by larger deposits of architectural debris.

Space 3025

This exterior area was situated directly outside the outer city wall and was positioned directly west of the original trench from season 2009/2010. It contained a sequence of dumped midden deposits along with signs of architectural dilapidation. These slumped gradually down in level from the outer city wall and contained mixtures of dark grey and orange silty sand together with thin beige lenses of dumped ash and organic refuse. They were packed with a multitude of material finds including copper coins (providing good dating evidence), copper broaches and pendants, beads, stone musket balls and very large quantities of animal bone and pot. All deposits displayed the fact that domestic waste was being dumped liberally outside the city wall as well as around tower <4012>.



Figure 2.32: ZUEP04 -Buttressing of outer city wall

2.3.5 Conclusion and scope for further work

The excavations at ZUEP04 clearly achieved the main objectives established at the beginning of the season and revealed exceptional archaeological remains, adding seven more interior spaces to the twenty already examined from season 2010/2011. These spaces, continued the idea that Precinct Section 8 was geared towards domestic living. Tantalising glimpses of the compound areas both to the north and the east showed that the compound was connected by passageways and interlinked, not only just internally but to the outside as well. Spaces 3026-7 revealed that each domestic unit was connected by corridors embellished with moulded intricate plaster work and large impressive archways.

Examination of the external areas allowed a massive recovery of datable material including pottery, small finds and more importantly coins, the total number of which dwarfed the collective total found from the previous two seasons. Moreover, the extension of the original trench from 2010 allowed a further larger examination of the outer city wall and the associated buttress

Deposits and features revealed the slow development of the exterior area from construction through to dilapidation. The six groups separating the deposits within Space 3024 illuminated the sequence of building construction with its accompanying temporary structures, through to the extensive waste-tipping activities and pitting centred around the tower and then finally to the general dilapidation and abandonment of the building. Examination of the central courtyard deposits also proved interesting and the five sequences of surface renewal strengthened the argument proposed last season that the compound, when occupied, underwent a continued process of renewal.

Future work would ideally aim to finish the excavation of the central courtyard surfaces, ahead of the conservation process which would finish preserving the eastern wing. Since these deposits run beneath the remodelled threshold into Space 3020, it is likely that excavation will be needed here too. Investigation into Space 3020 would also be beneficial since it contained a blocked doorway through to corridor Space 3026. It would be ideal to see if the stratigraphy within the corridor is linked in any way to the small north-western courtyard. Space 3026 and 3027 would therefore have to be fully cleared of the rubble collapse of Phase 4 for this to begin. The corridor stratigraphy will also be examined in conjunction with the exterior areas in the west, including external areas 3022 and 3023. The main aim here would be to connect the stratigraphy found around the tower to the stratigraphy of the interior compound. In short, it would aim to physically link the white construction horizon surface (4731) at the base of the central courtyard to the white construction horizon around the tower (limestone surface 4576, presumed to lie at the bases of Spaces 3022 and 3023). This is a large task but judging by the limited stratigraphy in the exterior zones it could be possible. This would therefore link all the stratigraphy neatly, forming a very decently dated picture of Phase 5 of early Zubarah. Once this possible link had been established, strategically placed sondages through the white construction surface could be excavated to check for earlier archaeological features.

2.4 AL ZUBARAH EXCAVATION POINT 10 (ZUEP10)

Daniel Wheeler

2.4.1 Introduction

The principal aims for ZUEP10 were to:

- establish the depth of the Al Zubarah outer city wall, determine its construction method and remove all deposits later than its initial phase, allowing for continued preservation
- ascertain whether the small gateway within the wall to the north of Tower 8 was contemporary with its construction or added during earlier preservation work on the tower during the 1980s
- gain an idea of the function of the area around tower 8 and determine a rough dating spectrum based on the established Al Zubarah phasing

ZUEP10 revealed an unexpectedly dense sequence of archaeological deposits representing continued activity in this area throughout the main phases of Al Zubarah's occupation and subsequent abandonment (see Figures 2.33 and 2.34). The earliest activity, represented by a number of postholes, pits and patchy surfaces, seems to be directly associated with the construction of the main city wall, with little or no evidence of any prior occupation. Once the wall was in place, the immediate vicinity appears to have been used mainly as a thoroughfare with trampled surfaces forming across the area. Soon after, the construction of a *banquette* walkway on the inner side of the city wall, turning the higher part of the wall into a defensible

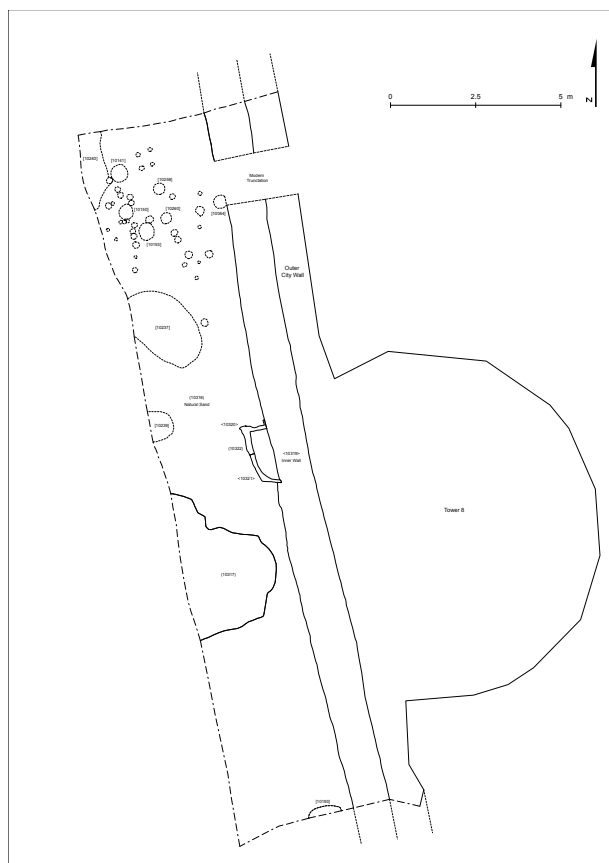


Figure 2.33: ZUEP10 - Post-excavation plan



Figure 2.34: ZUEP10 - Post-excavation kite photograph

parapet which could be patrolled, and if necessary, fired from, seems to mark a transition in the area. This refortification, probably coinciding with increased tribal tensions around the turn of the 19th century begins, a period of increased activity and potentially semi-permanent occupation in the area. A number of laid surfaces cut by postholes suggest the possibility of *barasti*-style dwellings built against the lower wall complete with a nearby *tannur* installation set into the wall itself, and other evidence of cooking and domestic activity. Hereafter, this type of occupation becomes more sporadic and probably represents the period after the sacking of the city by forces from Muscat in 1811 and the town's subsequent contraction behind the smaller, inner wall. Even after this shift, the presence of *tannurs*, small working surfaces and large concentrations of finds indicate that there was still activity in this area, suggesting that the outer wall and Tower 8 were still used sporadically as a lookout post and shelter. Eventually, as the town falls towards full abandonment, only a few opportunistic fire pits and hearths underlie the inevitable mix of collapsed wall and wind-blown sand. Cut into this wall tumble to the north of Tower 8, and filled with modern material, is an access-way attributable to the reconstruction team of the 1980s who clearly installed the small gateway in the wall to allow themselves easier entry to the inside of the city and the western side of the tower.



Figure 2.35: ZUEP10 - Postholes and quarry pits associated with the tower and wall



Figure 2.36: ZUEP10 - Banquette acting as a walkway against outer parapet wall

2.4.2 Methodology

ZUEP10 was opened at the beginning of the 2011-12 season against the inner side of the city wall in the north-east of Al Zubarah. Running approximately north-south, the area was 21m long and 5m wide and focused on the area of wall flanking Tower 8 (Figure 2.33). Due to the ephemeral nature of much of the archaeology and the lack of large stratified architecture it was sometimes difficult to directly associate the established Al Zubarah phases to deposits seen in ZUEP10. However, some broad phasing can be applied.

2.4.3 Phase 6

Approximately 36 post and stake holes cut into the natural sand represent the earliest activity in ZUEP10, possibly indicating the use of tents or barasti prior to the town's large Phase 5 expansion (Figure 2.34). However, the nearby presence of a large mortar construction deposit next to Tower 8 and two substantial pits seemingly aimed at quarrying large stones from the underlying natural limestone probably indicate that all of the earliest activity was in fact associated with the construction of the city wall at the very end of Phase 6 or the beginning of Phase 5.

2.4.4 Phase 5

After the construction of the city wall a number of accumulation surfaces built up along the inside suggesting that this area was initially used as a trackway and thoroughfare for moving around in the gap between the wall and the extents of the town. This transitory period ends with the construction of a lower walkway against the inside of the city wall and an increased



Figure 2.37: ZUEP10 - Tannur installation against *banquette* wall



Figure 2.38: ZUEP10 - Stakeholes supporting temporary structures

focus of activity in the area. Approximately 1.1m tall and made of locally sourced beach rock and gypsum with a rough plaster face, the lower wall acted as a fire-step or *banquette* allowing sentries to patrol along the length of the city limits and use the higher outer wall as a parapet from which to return enemy fire (Figure 2.36). This refortification appears to be city-wide with a similar addition seen in ZUEP04 (see above).

A small mortar-rendered bench containing two tannur ovens installed into the side of the lower wall is indicative of the change in use of this area at this time (Figure 2.37). Owing to the increased prospect of attack during the early 19th century, there was likely to have been greater activity around the city limits with guards using the towers on either a permanent or semi-permanent basis. This is seen in the increased appearance of domestic evidence in ZUEP10; an initial phase of compacted surfaces with postholes and stake holes perpendicular to the wall indicate that wind-breaks or palm-frond shelters were erected against the wall with a series of tannur ovens to the north used for cooking (Figure 2.38). A secondary phase of potential structures follows a mortar resurfacing of the area, this time focussed around a central hearth and surrounded by accumulation deposits rich in domestic detritus.

2.4.5 Phase 3 and 4

The transition from Phase 5 is not obvious within ZUEP10 with no evidence of the widespread destruction deposits caused by the attack on the city in 1811 or the subsequent period of inactivity. This is hardly surprising with lack of architecture and the location's distance from the centre of the city. There is, however, a noticeable decline in activity in the area corresponding to the abandonment of the outer extent of the city and the withdrawal behind the inner wall. The shelter and vantage point afforded by Tower 8 and the wall may have seen its use continue past the area's desertion with evidence of patchy surfaces, *tannurs* and burnt areas still indicating some short-term occupation.

2.4.6 Phase 1 and 2

Phase 2 archaeology consists of small burnt areas and fire pits up against the inside of the wall probably made by passing travellers or shepherds utilising the shelter of the still-standing architecture. A layer of wind-blown sand then seals all the previous deposits before the wall gradually collapses on top of it. A layer of modern overburden is only interrupted by an opening knocked through both the main wall and lower walkway by the reconstruction team of the 1980s who later conserved the gap as part of the wall.

3. FIELDWORK IN FREIHA

Gareth Rees

3.1 FREIHA SURVEY

3.1.1 Introduction

Work at Freiha during the 2011/2012 season of fieldwork consisted of two excavation points, survey, aerial photographic survey and targeted field walking. Additional survey work was carried out to the south of the settlement, where fragmentary remains of buildings and middens were identified. Work focused on Excavation Point 04 (FREPO4), which was opened during the previous season, whilst a smaller excavation point (FREPO7) was placed over one of the middens in the newly identified southern area of the settlement (Figure 3.1). Targeted field walking aimed to pick up surface finds from each of the zones of activity in order to establish a closer chronology for the morphology of the settlement.

3.1.2 Digital Survey

At the beginning of the most recent season of fieldwork it was observed that house platform features were present in an area to the south west of the unwallled cemetery. This area was the focus of a survey using TS09 Leica Total Station, located 350m to the south of the mosque, 30m to the north of the modern villa compound (Figure 3.1) and was bounded to the west by the sea and the east by the cemetery. Five large middens were identified in this area and could be seen to contain ceramics. No complete buildings were identifiable but seven distinct mounds were visible, some of which contained wall footings. Two large house platform mounds were surveyed in the centre of this area and may have been the focus of occupation here. A large modern feature was also surveyed. This appears to be a ridge of material bulldozed up from the east which created a track running from the modern villa wall to the sea. This feature can be seen first on the 1963 aerial photograph of the settlement. A midden was located 178m to the south of the mosque, a short length of dolomite wall located in the north east quadrant of this feature may indicate that it overlies architectural remains.

3.1.3 Kite Photography

The aim of this survey was to photograph the well preserved building remains to the south of the fort and up to FREPO4, 260m to the north. The photography and subsequent rectification was designed to provide high definition aerial mapping of these buildings in order to add detail to the pre-existing plan of the site. A secondary aim was to establish the physical and temporal constraints of large scale kite photography on the site. A grid was laid out in order for the photos to be rectified. Preliminary results indicate that this method of photography would add greatly to what is already known of the settlement if it were applied to the entire site.

3.1.4 Fieldwalking

A walkover survey was conducted over a north to south and an east to west transect across the site in order to gather detailed artefactual dating evidence from which to establish a chronology for the settlement morphology.

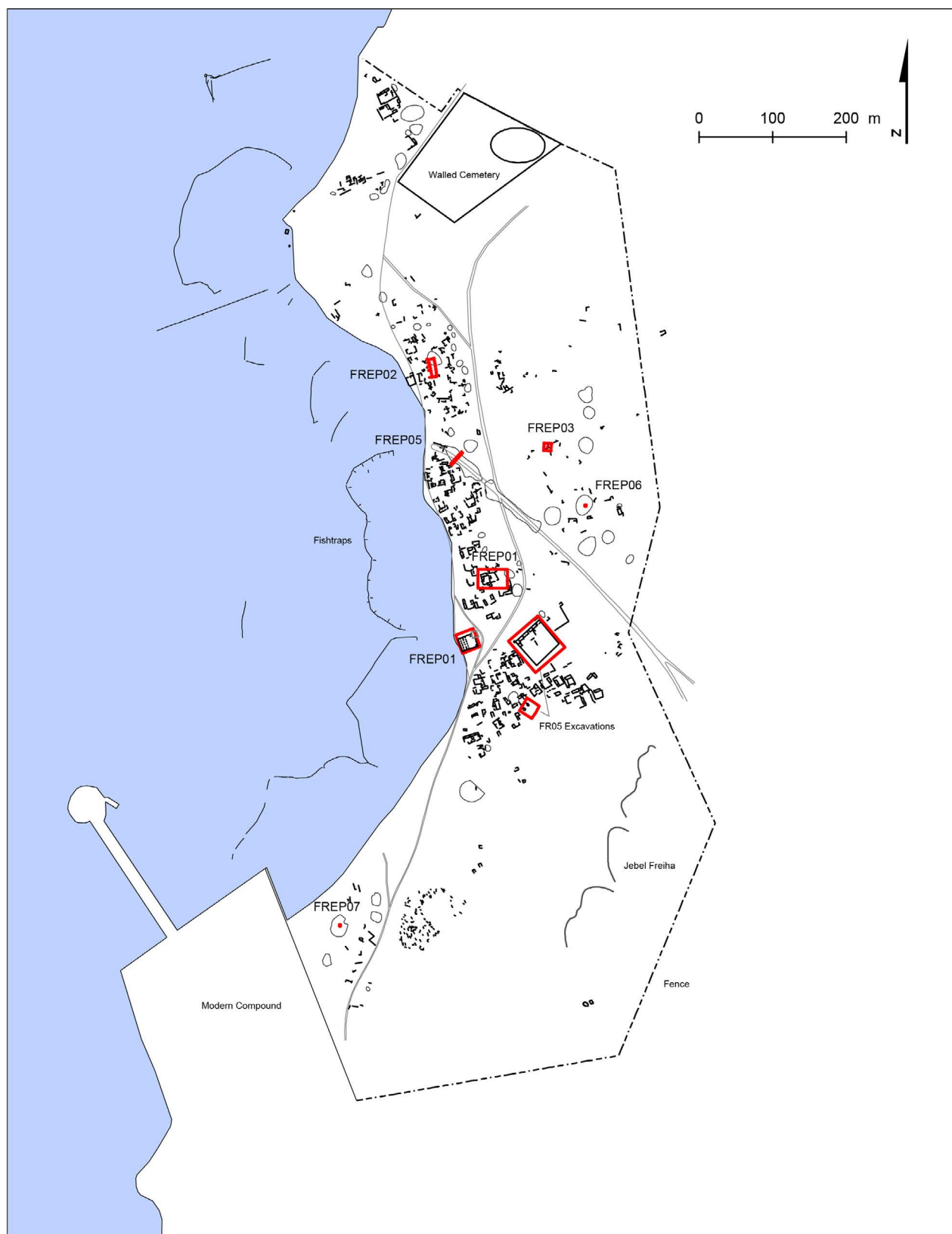


Figure 3.1: Freiha excavation points



Figure 3.2: Phase 6 Post built structures

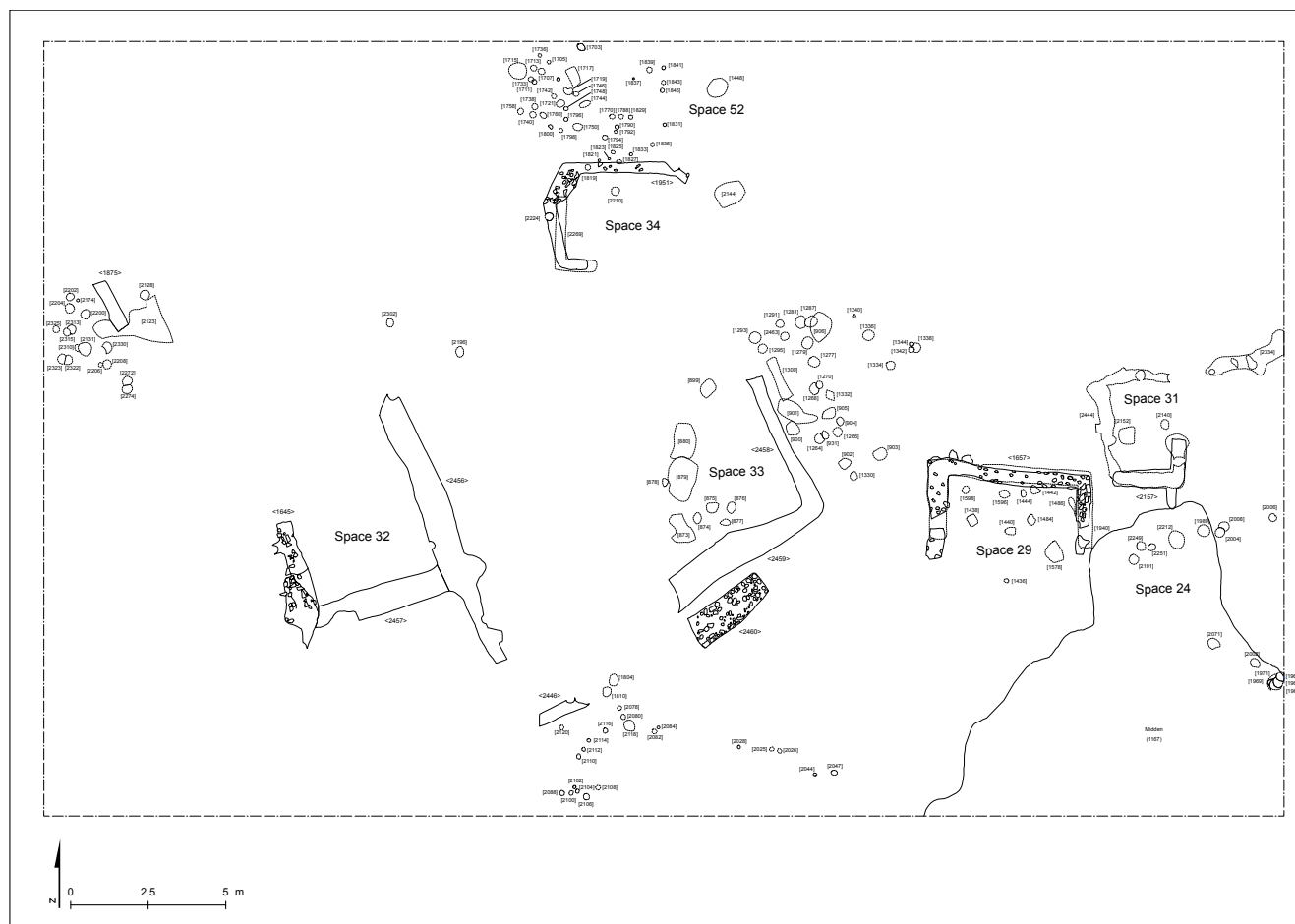


Figure 3.3: FREP04 - Phase 4

3.2 FREIHA EXCAVATION POINT 4 (FREPO4)

3.2.1 Introduction

Previous excavations in this excavation area had uncovered the remains of two courtyard compounds, a midden and traces of mud-brick buildings. Each of the compounds consisted of a rectangular room (Space 7 and Space 14) with a doorway to the south-south-east facing onto a courtyard (see 2010/2011 end of season report). These rooms appeared to have been amongst the earliest stone-built structures in the area. Space 14 had a single courtyard associated with it whilst the external area associated with Space 7 was added to and altered several times. The aims of the most recent season of fieldwork were to establish the foundation level on to which Space 7 and Space 14 were built as well as to investigate the mud-brick buildings which were thought to represent an earlier phase. The overall aim was to establish the complete sequence of deposits down to bedrock. This was achieved to the east of the trench; however, the high density of occupation associated with Space 7 compound to the west meant that only the top of the Phase 3 occupation was exposed by the end of the season. Six phases were uncovered in total.

3.2.2 Phase 6: Post-built structures on natural sands

Occupation during Phase 6 was characterised by substantial post-built structures and multiple fire pits. Features in this phase were cut directly into the natural sand or were closely associated with it in the east of the trench. This phase is yet to be uncovered in the majority of FREPO4. A compacted sand layer may have been the result of occupation on the original natural beach-sand surface. It was from this surface level that a pearl bead was recovered. The remains of two small buildings, in the form of deep postholes in rectangular arrangements, may indicate the location of small shelters or wind breaks (Figure 3.2). The depths of the postholes and the packing material used to stabilise them is indicative of semi-permanent occupation. Evidence of activity within these structures consisted of multiple firepits and a single tannur. To the north of these structures an area of intense activity was uncovered, consisting of fifteen fire pits and four tannurs. Several of these fire pits had been dug into one another indicating returning occupation in the same area. Although no structural evidence was uncovered, the alignment of these features may be indicative of their location near a wall line, tent or wind break.

3.2.3 Phase 5: Barasti-style temporary structures

Evidence from Phase 5 consisted of insubstantial post-built structures associated with pits, surfaces and tannurs indicative of more temporary occupation. Three areas of activity were located. These were evidenced by sand and shell surfaces and occupation horizons associated with multiple fire pits and occasional tannurs. A clay-lined pit with beach stone slab in the northern area may have been a basin for washing or processing whilst a large sub-rectangular pit may have been used for storage.

3.2.4 Phase 4: Pisé and mud-brick buildings

The first evidence of permanent occupation of the site occurred in Phase 4 when pisé and mud-brick buildings were constructed (Figure 3.3). These were associated with substantial surfaces and many tannurs but also several barasti style dwellings. The intensity of activity in this phase has led to it being divided into four sub phases.

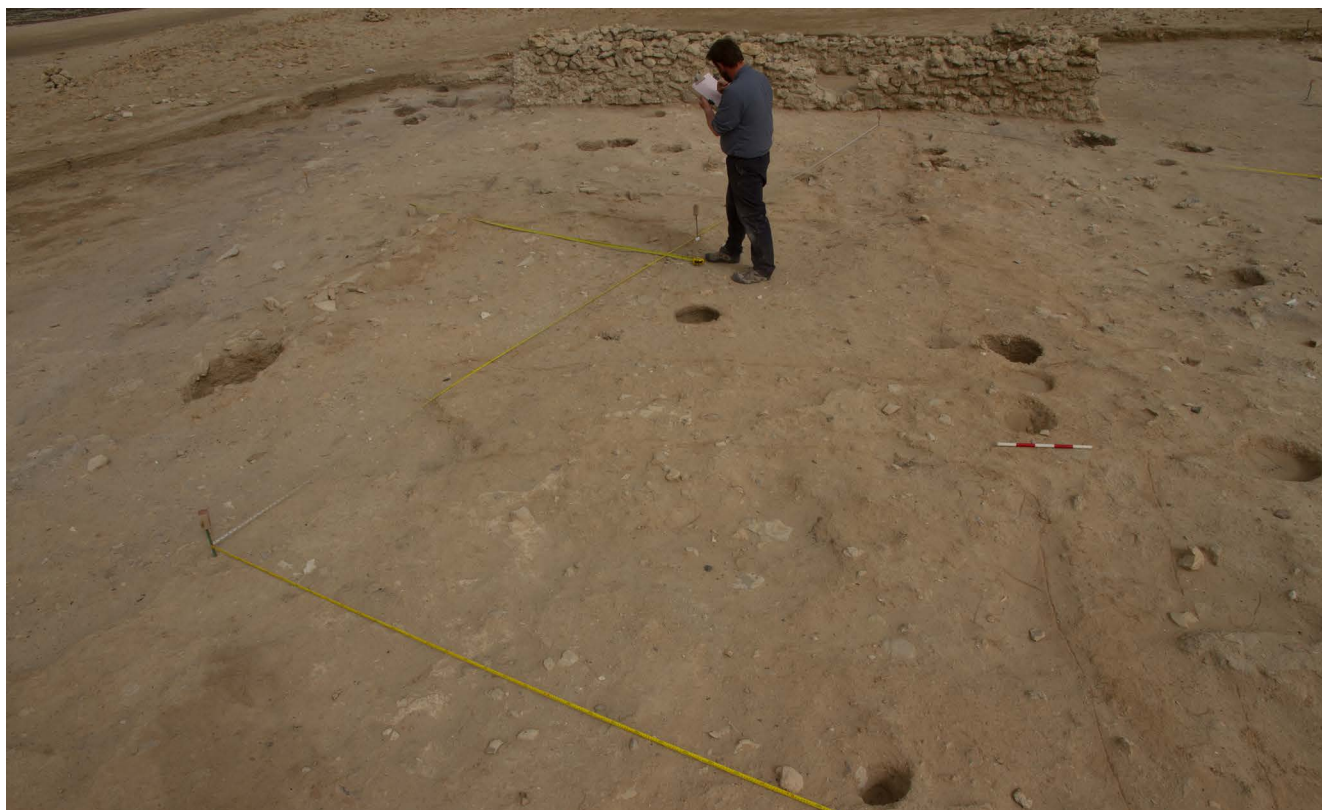


Figure 3.4: FREP04 - Pisé remains of Space 32 during planning, facing northwest



Figure 3.5: FREP04 - Mud-brick footing, facing west

Phase 4.1

Three buildings (Space 32, Space 43 and Space 33) with pisé footings were constructed in this period to the east and centre of the excavation area (Figure 3.4). These buildings remain unexcavated but appear to form part of a series of rooms aligned NNW-SSE against the prevailing wind. The eastern most room may have contained a post-built internal dividing wall. Three activity areas were located to the east of this room. These areas comprised tannurs, mortar and clay-lined pits and an elongated pit, thought to be used for making charcoal. These activities may have taken place outside of the building perhaps in a tented space. A rectangular earthen (mud-brick) wall footing was located to the north of these buildings and contained only a single pit containing rice husks (Figure 3.5).

Phase 4.2

After the construction of the pisé buildings intensive occupation took place around them with a series of activity areas uncovered in all parts of the excavated area. This activity consisted of tannurs, clay-lined basins, fire pits and postholes, indicative a multi-functional, semi-permanent use of these areas. A post-built structure to the north of the mud-brick building may have been used for penning animals.

Phase 4.3

An expansion of activity to the east took place in this period with a rectangular earthen footing for a mud-brick wall replacing one of the post-built structures of Phase 5 (Space 29). Activity external to this room was present to the east in the form of fire pits, a tannur and a lime mortar pit.

Phase 4.4

This period was characterised by the collapse of the mud-brick and pisé buildings. Thick layers of mud-rubble accumulated around these buildings and a midden deposit was formed in the south east corner of the excavation area.

3.2.5 Phase 3: Intensive, semi-permanent occupation

Occupation activity in this phase was located on the rubble layers of the previous phase indicating a hiatus in use of this area. It was typified by a variety of activities, specifically tannurs, mortar making pits, fire pits and charcoal making pits (Figure 3.6). These were uncovered across the excavation area but the highest density of activity was in the west over the rubble of Space 32. Alignments of features, associated with very little structural evidence, were indicative of activity focused in or around tents. The density of activity suggest semi-permanent tented occupation. The number of lime-mortar making pits (Figure 3.7) uncovered may also be indicative of stone-built structures being constructed elsewhere in the settlement.

The plan shows the excavated area with the following spaces and features:

- Space 72:** Located at the top left, containing a small circular feature labeled [1463].
- Space 7:** A large rectangular space in the upper left, bounded by walls labeled <513> and <321>.
- Space 30:** A narrow space to the left of Space 7, with a wall labeled <520>.
- Space 42:** Located below Space 7, containing several circular features labeled [1690], [1700], [1702], [1731], [1728], and [1692].
- Space 46:** A small space at the bottom left, containing a rectangular feature labeled [1547] and a circular feature labeled [1561]. A note indicates "compact foundation material" near feature [1540].
- Space 26:** A large space at the top center, containing a complex wall structure with labels [1380], [1382], [1383], [1391], [1377], [1403], [1368], [1420], [1412], [1370], [1429], [1327], and [1313]. A note indicates "walls robbed".
- Space 14:** A large space in the center, containing a wall labeled <517> and a circular feature labeled [830].
- Space 12:** A large space at the bottom center, containing a wall labeled <518>.
- Space 36:** A small space to the left of Space 12, containing two circular features labeled [1610] and [1612].
- Space 74:** A small space at the top right, containing a circular feature labeled [1547].
- Space 27:** A small space to the left of Space 74, containing two circular features labeled [1530] and [1537].
- Space 75:** A small space at the top right, containing a rectangular feature labeled [1554] and a note "amphora fire pit".
- Space 76:** A small space at the bottom right, containing a circular feature labeled [1550].
- Space 38:** A small space at the bottom right, containing several circular features labeled [1052], [1157], [1055], [1058], [1063], [1060], [1143], [1616], [1067], and [1617].

A scale bar at the bottom left indicates a distance of 5 meters, with a north arrow pointing upwards.

50

3.2.6 Phase 2: Stone-built structures I

Two rectangular rooms (Space 7 and Space 14), around which all subsequent occupation was based, were constructed in this phase (Figure 3.8). Space 7, contained a madbasa whilst Space 14 contained a plastered basin. A temporary structure was built to the west of Space 14 before the construction of a large courtyard to the south the rectangular room. A third stone-built room (Space 26), located to the north of Space 14, contained domestic activity in the form of fire pits, tannurs and lime-mortar making pits (Figure 3.9). Small cellular rooms, constructed from anhydrite rock walls, were uncovered to the west of the trench whilst a fourth stone-built wall was located to the far east. Although fire pits and tannurs were present in this phase they were considerably less prolific than had been the case in the previous phase. A large pit located to the north east may have been used to heat anhydrite and limestone to make mortar for bonding the stone walls of this phase (Figure 3.10).



Figure 3.9: FREP04 - Space 26, facing west



Figure 3.10: FREP04 - Large pit for making lime-mortar

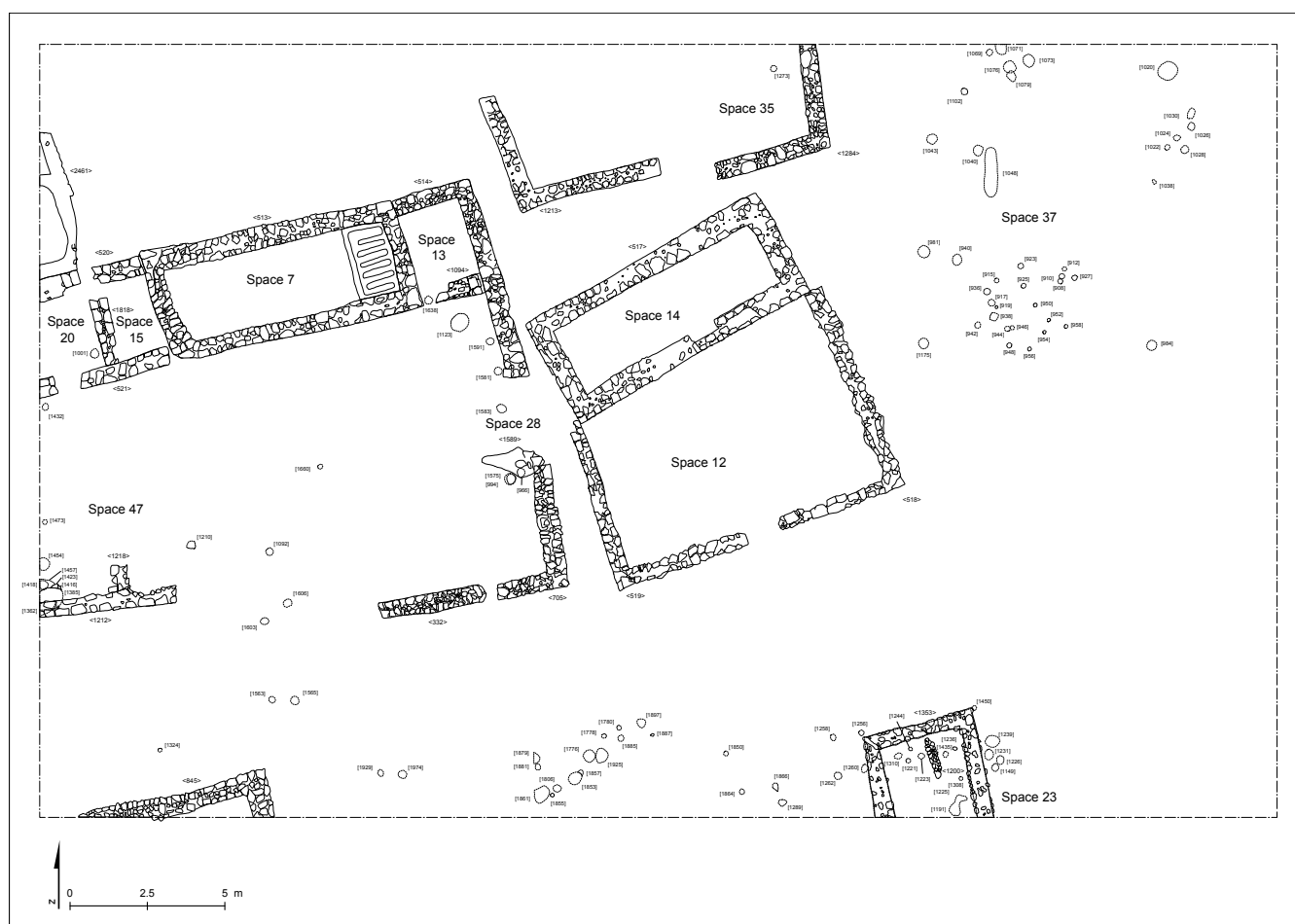


Figure 3.11: FREP04 - Phase 1.1 and 1.2 architecture

3.2.7 Phase 1: Stone-built structures II

Phase 1.4 (Figure 3.11)

Several walls were constructed in this period, adding new rooms (Space 20, Space 15, Space 28) to the courtyard space south of Space 7 as well to the north of Space 14. Whilst these rooms did not contain many features, extensive external activity was taking place to the south and the north-east where multiple tannurs, fire pits, basins and occupation horizons were uncovered. To the north-east of the trench, four zones of domestic activity could be identified from the location of these features whilst postholes located between them may be indicative of animal pens. It is notable that domestic activity, probably in tents, was taking place away from the stone structures.

Phase 1.3

The courtyard of Space 7 was formalised into a trapezoidal space by the construction of stone walls to the south and east. These walls added several rooms (Space 13, Space 25, Space 81) to the complex and left entrances from the east and the south. The southern entrance appears to have been an area where midden material was dumped during this period. Space 28 is likely to have gone out of use and may have been deconstructed by this time. A substantial mud-brick and stone-built wall footing was constructed to the south east of the excavated area. This wall formed a rectangular room (Space 23) aligned NNW-SSE that was distinctly different in orientation and construction method from any of the others uncovered (Figure 3.12). It



Figure 3.12: FREP04 - Mud-brick footing, Space 23, facing west

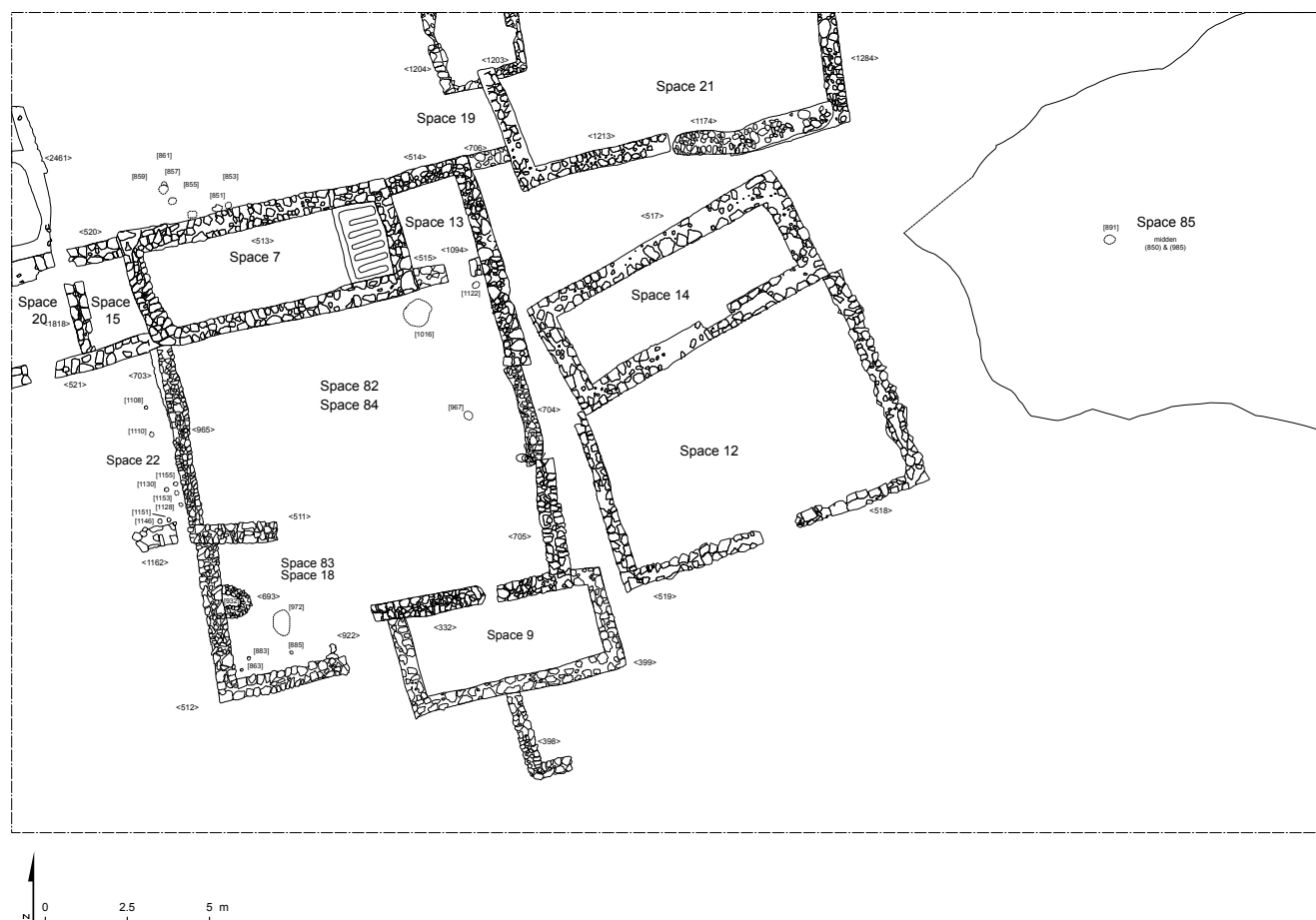


Figure 3.13: FREP04 - Phase 1.3 and 1.4 architecture



Figure 3.14: FREP04 - Phase 1.3 courtyard, facing west

contained several periods of shell surfaces followed by collapse and rebuilding. The collapse was evidenced by mud-rubble layers indicative of mud-brick, which was then cut through by scaffolding posts before re-surfacing. This space may have been part of a separate building complex to the south east.

Phase 1.2 (Figure 3.13)

Three of the rooms (Space 23, Space 20 and Space 15) fell out of use by this time and the Space 7 courtyard area became smaller as access was no longer required to these rooms. The eastern courtyard entrance was blocked off and construction of two walls to the west left only a narrow entrance out to Space 22 (Figure 3.14). A room (Space 8), possibly for storage, was added to the south of Space 81. Rubble walls were added between buildings to the north of the trench creating a large irregular shaped courtyard (Space 21) and an external area to the north of Space 14. A small room with a thick shell surface was also added to the north (Space 19).

Phase 1.1

The final activity in this area consisted of further remodelling of the Space 7 courtyard with the western entrance blocked leaving only one narrow entrance to the south. This blocking may indicate that Space 22 had fallen out of use. The courtyard was resurfaced and was later used for fire pits. Two rooms accessed from the courtyard were added one of which (Space 18) contained a stone lined pit and thick shell surface. This room may have been open to the west. The room to the south east of the courtyard appears to have fallen out of use leading to the blocking of the entrance to Space 8, which was facing the prevailing wind. This may have led to the construction of a new storage room to the south, outside of the courtyard. A large midden located to the north east of the trench may have built up during Phase 1 and 2 occupation.

3.3 FREIHA EXCAVATION POINT 7 (FREPO7)

3.3.1 Introduction

Additional survey work carried out to the south of Freiha identified several buildings and middens (see above). The state of preservation of these buildings, was similar to that which had previously been recorded to the east of the settlement. Excavation of one of the buildings to the east (FREPO3) had demonstrated a comparatively early date for this area. Given the similarity of the newly identified buildings to the south it was decided to excavate a 2m x 2m trench in one of the large midden mounds in this area.

3.3.2 Stratigraphic Sequence

The midden was excavated in six loci (Figure 3.15). The upper layers had been disturbed and all but the lowest locus contained ceramics with the highest concentrations of artefacts, including metal, glass and bitumen, being recovered from the uppermost three loci. The midden consisted of dumps, rich in dark organic material and charcoal, interspersed by wind blown sand. A sand layer with features cutting through it, may have constituted the land surface prior to midden dumping. The laminated deposits uncovered in this midden are indicative of regular dumping, presumably from occupation nearby. The size of the midden is a good indication that it was in use for a sustained period of time. Artefacts recovered from this feature will add the current knowledge of the overall settlement morphology of Freiha which had previously not been identified this far south.



Figure 3.15: FREP07 - Stratigraphic sequence (northern section)

3.4 DISCUSSION

Evidence of the remains of settlement, in the form of house platforms, at the southern extent of Freiha suggests that the first period of occupation was more extensive than previously thought. This new area of settlement centres the domestic building activity in the area of the mosque and fort, suggesting that the latest occupation had shrunk back to a central core. The buildings encountered in FREP04 Phase 3 were similar in construction to those uncovered in FREP03 to the east, whilst those of FREP04 Phase 5 were similar to those found in FREP05 to the north. These comparisons along with the ceramic and radio carbon dating recovered from excavation and field walking will lead to a much closer chronology for the growth and abandonment of the settlement. The excavations in FREP04 have continued to uncover a complex and dense occupation sequence. This began with post-built structures, followed by pisé and mud-brick permanent dwellings which were replaced, after a structural hiatus, by stone structures. The most extensive activity was most commonly found in external areas with internal spaces only containing a few features. This pattern may imply that the rooms tended to be used for storage or sleeping but not domestic activity.

4. EXCAVATIONS IN FUWAIRIT

4.1 FUWAIRIT EXCAVATION POINTS 1-20 (FUEP01-20)

Daniel Wheeler

4.1.1 Introduction

Excavations in Fuwairit during early 2012 were focused on recording archaeology revealed by a series of small interventions along the western edge of the main settlement (Figure 4.1). The primary objectives were to:

- Characterise the large building on the western edge of Fuwairit that appeared likely to be a town mosque.
- Provide a stratigraphic sequence through one of the large middens that flank the western side of the town and gather an assemblage of material culture for analysis and dating.
- Compare this assemblage of finds with those from others deflated middens in the area.
- Ascertain if there is any evidence for a town wall running along the western edge of Fuwairit that has subsequently been buried beneath these middens.
- Investigate the large blank areas to the north-west of Fuwairit to establish if there is any archaeology present.

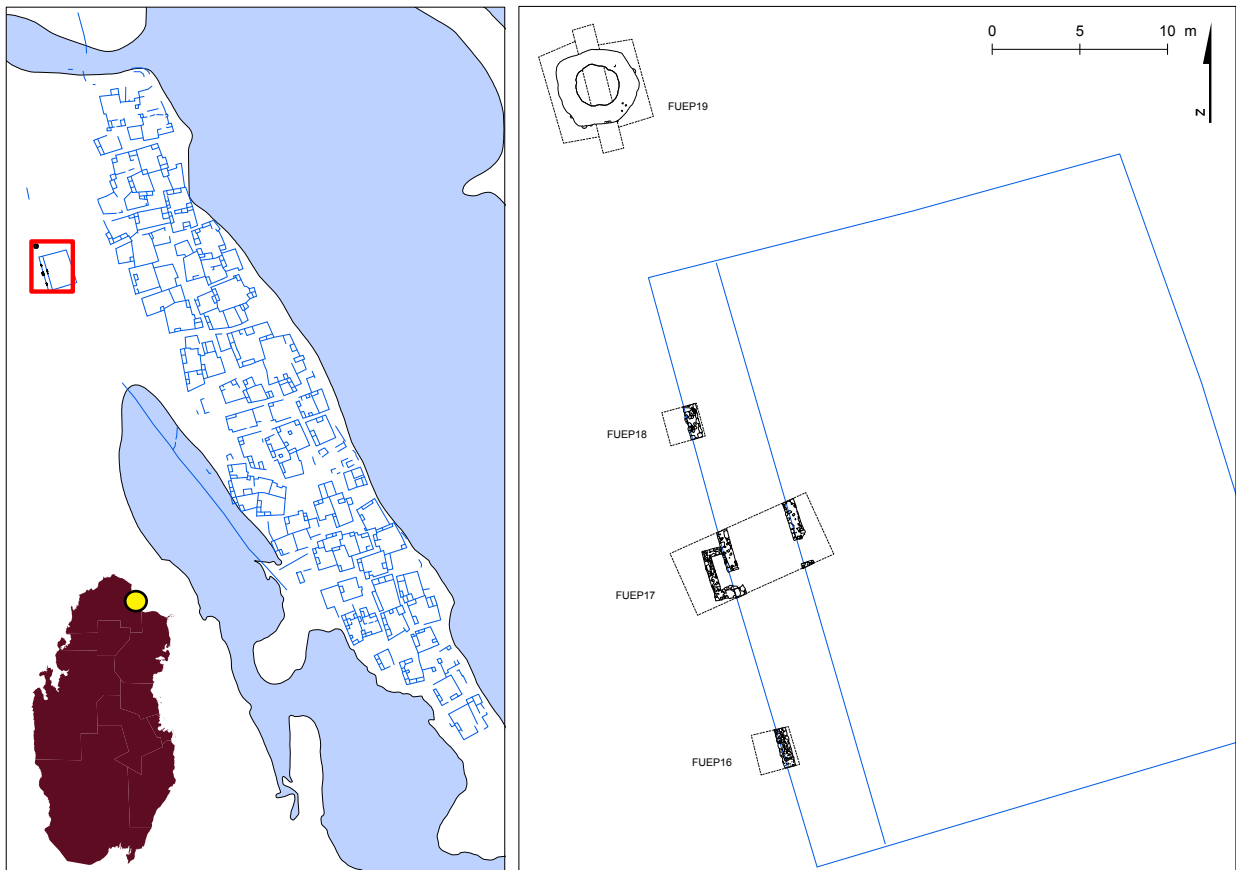


Figure 4.1: FUEP - Location of excavation points within Fuwairit

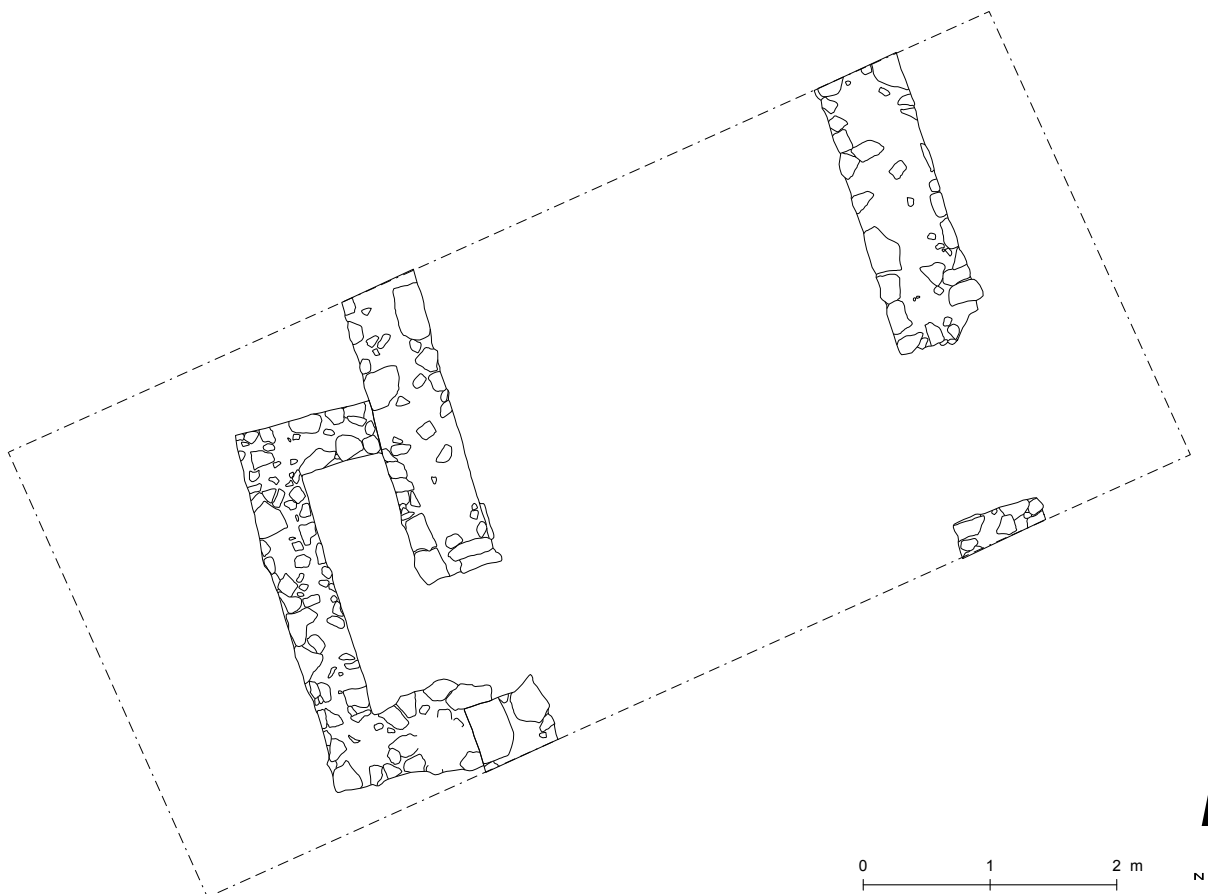


Figure 4.2: FUEP17 - Plan



Figure 4.3: FUEP16, 17 and 18 - mihrab extending from qibla wall Photo needed

Excavations in Fuwairit took the form of twenty individual excavation points (FUEP01-20) and provided a large and varied range of archaeological information. The majority of these excavation points were only small enough to make basic conclusions but the more significant areas were expanded to gain additional information. Investigations confirmed the large building on the western edge of the town to be the town mosque and identified the *qiblah* wall and *mihrab*. A large amount of finds were recovered from a number of middens situated outside the main settlement including one particular example that was excavated down to natural beach sand. Analysis of this material culture should provide an unparalleled insight into the everyday lives of the inhabitants of the town. An extraordinary amount of fish bone and marine shell was found across all of the excavation points in Fuwairit, further emphasising the dependence people had on the sea during this time. A highly-degraded and enigmatic circular structure was discovered positioned upon one of the large middens; its purpose – perhaps defensive or domestic – remains unclear. An abundance of discrete features cut into the natural sand to the north-west of the town showed that this area on the periphery of Fuwairit, despite appearing blank, was rich in important archaeological activity.

4.1.2 Mosque (FUEP16, 17 & 18)

The three excavation points along the western wall of this large structure proved irrefutably that it was a mosque (see Figure 4.2). Each area revealed a stretch of the *qiblah* wall which was solidly-built and capable of supporting a large, heavy roof. The central area (FUEP17) was expanded to reveal the *mihrab* and the prayer room wall (Figure 4.3). The *mihrab* was rectangular in shape and accessed by a gap within the *qiblah*. Constructed of generally poorer material and less substantial in width, the *mihrab* appeared to abut the *qiblah* wall. The prayer room wall was similar in size and make-up to the *qiblah* and is likely to be of the same construction phase. A small entrance way was also seen in the prayer room wall on a similar alignment to the *mihrab* doorway. The earliest deposit seen within FUEP18 was seen to run underneath the *qiblah* wall indicating that there was activity in this area prior to the construction of the mosque.

4.1.3 Midden and circular structure (FUEP19)

The initial intention of FUEP19 was to create a large cross section across one of the substantial middens that lie along the western edge of Fuwairit. The early discovery of a badly-degraded circular structure set atop of this particular mound meant, however, that a section could only be recorded in three separate parts (Figure 4.5). The wall of this structure was constructed of a mud and mortar combination mixed with a small amount of stone and had collapsed so much that only a very small amount still stood. On the interior, the wall seamlessly joined into a badly-laid floor that had entirely eroded in the centre. The inside of the wall had a smoothed, well-finished facing whilst the exterior side was rough and un-faced. A slight difference in the wall construction in the north, south and east edges perhaps suggested the structure was constructed initially from four supporting pillars or buttresses before the adjoining edges were added. The true function of this structure remains a mystery but its position atop the mound may indicate that it was a late and temporary defensive tower. The size and general poor-quality of the construction may however suggest that it was a something akin to a dovecote (Figures 4.4 and 4.5).

The underlying midden was a typical accumulation of multiple layers representing dumped



Figure 4.4: FUEP19 - Circular structure built atop midden

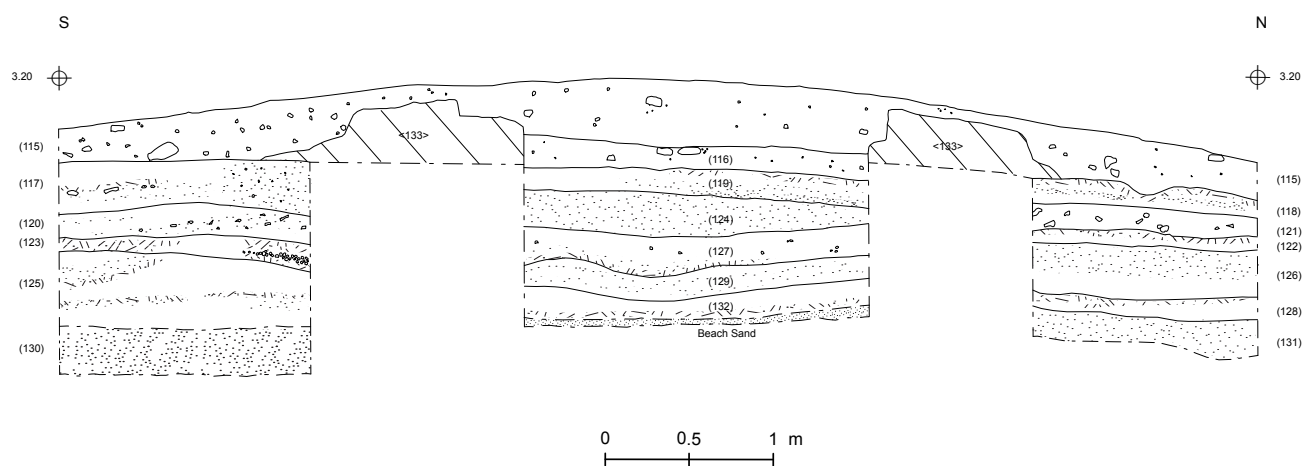


Figure 4.5: FUEP19 - Section through midden

everyday detritus. Each deposit was very rich in finds and material culture with an extremely large percentage of fish bone and shell. The main objective was to gather as much of this for later analysis as possible. Therefore, each context was sieved in its entirety through a 4mm mesh and a large unsieved sample was taken for flotation. A smaller sequence of samples through each individual lens within the northern extent was also taken for chemical analysis (Figure 4.5).

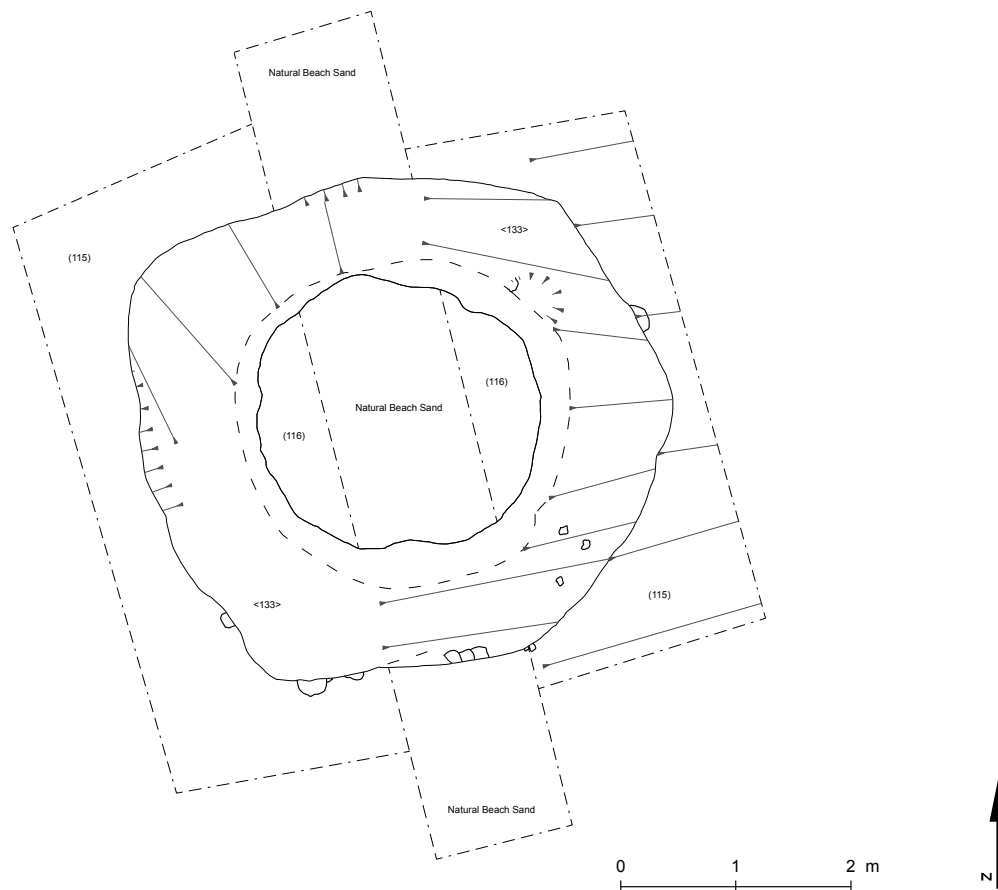


Figure 4.6: FUEP19 - Plan



Figure 4.7: FUEP09 - Wall remnant

4.1.4 Deflated middens (FUEP01-09, FUEP20)

Investigations to the south of the mosque revealed a series of deposits spread from the line of deflated middens that flank the western edge of Fuwairit. These were typical midden dumps rich in everyday material culture. This arrangement of middens may mark the town boundary, being placed upon the outer wall of the settlement. A ridge seen in the south-west of the town, seemingly heads towards the mosque before disappearing in this area. Potential walls seen in FUEP07 and FUEP09 may be part of this boundary, the upper extents having been later robbed away (Figure 4.7).

4.1.5 North-western area (FUEP10-15)

From the surface, the area to the north-west of Fuwairit appears to be blank, with no evidence of any extant architecture. Investigations here proved however that there is a plethora of features cut into the natural beach sand indicating substantial activity. A number of pits with sterile fills is perhaps to be expected but the presence of postholes, fire-pits and a clay lined tannur perhaps suggest occupation in this area, on at least a short-term basis (Figure 4.8).



Figure 4.8: FUEP10-15 - Clay-lined tannur and intercutting pits

5. REGIONAL SURVEY

5.1 GEODESIC SURVEY OF SITES IN THE AL ZUBARAH BUFFER ZONE

David Mackie

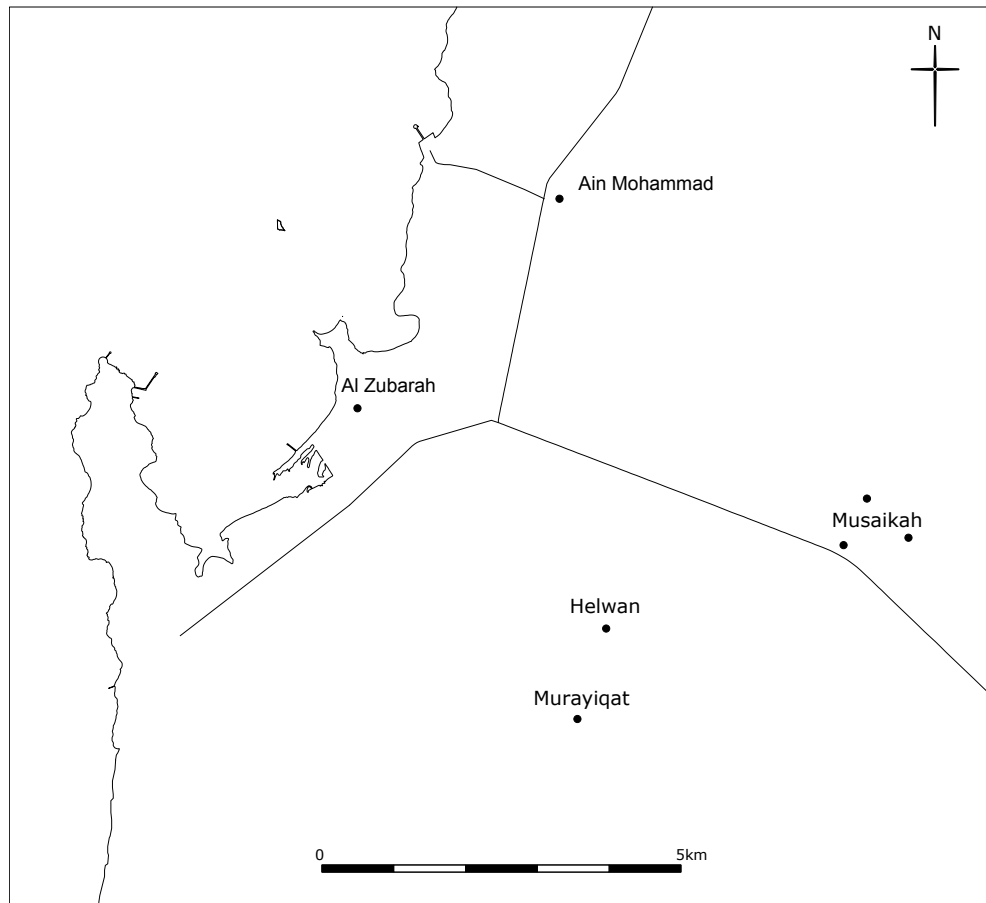


Figure 5.1: Sites surveyed in the hinterland of Al Zubarah in 2011-2012

5.1.1 Introduction

During the 2011-2012 season the mapping team has continued to undertake topographic surveys of sites within the hinterland of Al Zubarah. This season surveys were completed at Ain Mohammad, Musaikah, Helwan and Muhayriqat (Figure 5.1).

5.1.2 Methodology

The survey methodology remained the same as last season with regard to the surveying of features. Since wall lines are not always clearly defined on collapsed structures, the bottom of slope or collapse and the top of slope are surveyed. Where wall lines survive the wall face is surveyed, if the wall line is partially visible in plan and the centre line of the wall is surveyed. These lines with additional spot heights help if contouring is required at a later date while providing a realistic impression of the feature. Conjectured wall lines can be added post survey if required. This system allows both topographic, archaeological and other features to be surveyed.

Permanent survey control points were established on each of the sites with Qatar National Grid

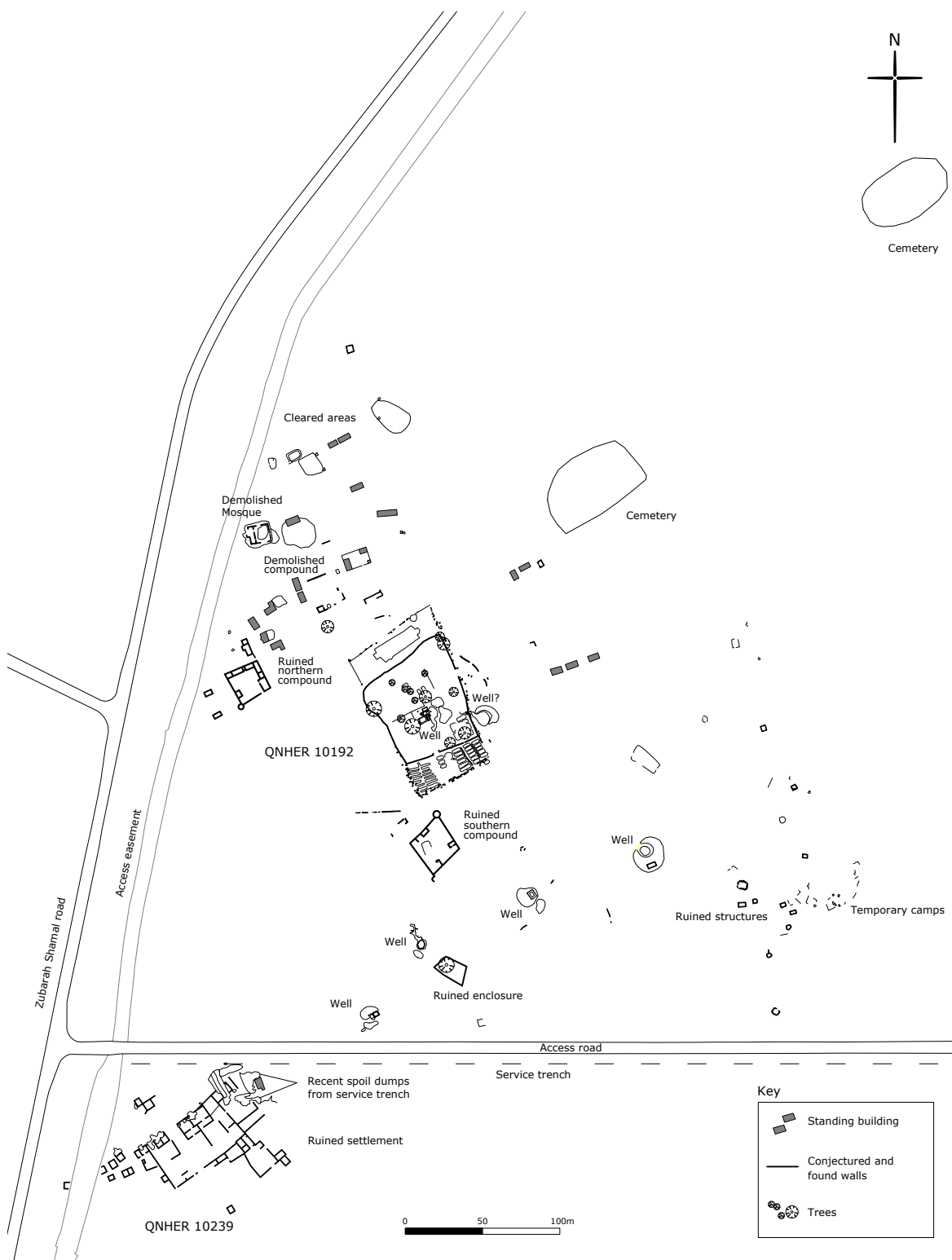


Figure 5.2: Ain Mohammad (QNHER 10192)

(QNG) coordinates using a differential GPS. The surveys were carried out using a total station and differential GPS.

5.1.3 Ain Mohammad, QNHER 10192 (QNG 183897E/472065N)

The site is situated c.4km north-east of Al Zubarah town and is characterised by twenty scattered relatively recent derelict buildings and a demolished mosque, with two walled cemeteries situated to the northeast of the site (Figure 5.2). Among these buildings are at least two earlier ruined compounds, one still has upstanding walls and the internal layout is clearly defined with rooms arranged along the north and east sides of the compound. Another room is located on the western wall and there is a round tower on the south-west corner. To the north-east are the remnants of another compound, all that now remains is a small ruined building on the south-west corner and traces of the compound walls can be seen in the ground.

An aerial photograph from 1958 shows this compound with other internal buildings and at least three other structures to the north but these have since been demolished when the later present buildings were built. This western compound appears to be in a ruined state in 1958 (Figure 5.3).



Figure 5.3: Western compound at Ain Mohammad



Figure 5.4: Ain Mohammad - walled enclosure constructed on the rawdah with a central well, concrete cistern and troughs



Figure 5.5: Ain Mohammad - ruined heavily deflated stone-walled compound

The centre of the site is dominated by a relatively recent walled enclosure constructed on the rawdah with a central well, concrete cistern and troughs. (Figure 1.4) Within this walled area there are the faint traces of cultivation and two date palm stumps. Two later extensions were added to the north and south side of the enclosure defined by stone filled oil drums, and the southern extension still has clearly defined cultivation patches. The 1958 aerial photograph shows that originally the enclosure was smaller, enclosing the north-east quarter of the present enclosure with the present well situated outside the south-east corner of the enclosure. The northern and eastern sides of this enclosure were retained when the enclosure was extended to its present size by the 1970s.

To the south-east of the walled enclosure situated on the rawdah is a ruined, heavily deflated, stone-walled compound which has at least three internal buildings arranged along the walls. There is a tower on the north-east corner and there may be the remnants of another one on the south-east corner but a later bulldozer scar has partially obscured this area (Figure 5.5). South of this structure is a line of four wells which are all visible on the 1958 aerial photograph. The south-eastern one has a later concrete lining and concrete cistern, the second collapsed stone lined-well has a small walled enclosure to its south. To the north-east of this is another stone lined-well that still retains water, and this has a later concrete capping and lining. The north-eastern well, appears to have been backfilled and has a small ruined stone structure constructed on the spoil heap. Another possible well lies on the eastern side of the main enclosure wall.

The other features picked up during the survey were the small ruined rectangular and square stone structures scattered along the eastern edge of the rawdah along with remnants of temporary camp positions. There are a number of wall lines scattered around the main enclosure and amongst the wells, some are clearly remnants of buildings while others may be remnants of enclosures.

Immediately to the south of the present access turning to the modern compound is small ruined small settlement QNHER 10239 comprised of a linear group of ruined stone buildings with enclosures on the south-eastern side. There is one abandoned standing building at the north-western end which is contemporary with the other derelict buildings on the site. This

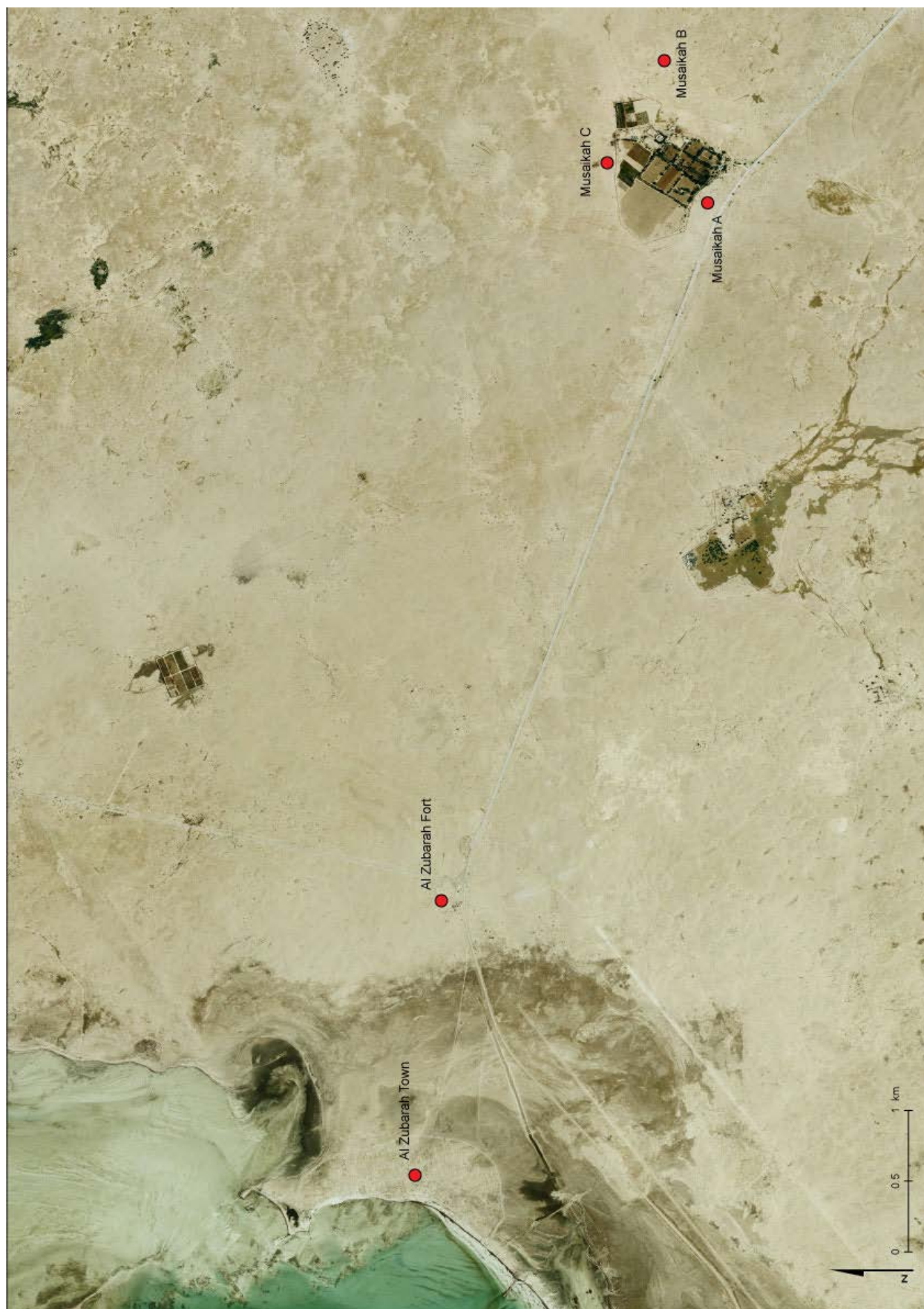


Figure 5.6: Musaikah and Al Zubarah

settlement is aligned south-west to north-east and may have extended further to the north-east but has been truncated by the construction of the access road and by an easement running parallel to the existing Al Shamal road.

5.1.4 Musaikah

Three sites are situated c.7km south-east of Al Zubarah outside the boundary of the present farm at Musaikah (Figure 1.6). Although the interior of the farm has been intensively cultivated the remains of the Early Modern fort and some footings still survive on the eastern edge.

Musaikah A, QIAH 40 309, (QNG 187882.343E/467237.027N)

This site is situated on the south side of the present farm and is comprised of a linear group of ruined buildings constructed on platforms with associated compounds or courtyards along the south side, with another two on the northern side. The buildings are square and rectangular in shape some of which are further divided into two rooms. Although in a ruined state the platforms and rubble from the buildings still survive to a considerable height. Due to the collapsed rubble the walls are not always discernible; however, some of the wall alignments and platform edges suggest that there may be more than one phase to the site. The site is aligned south-west

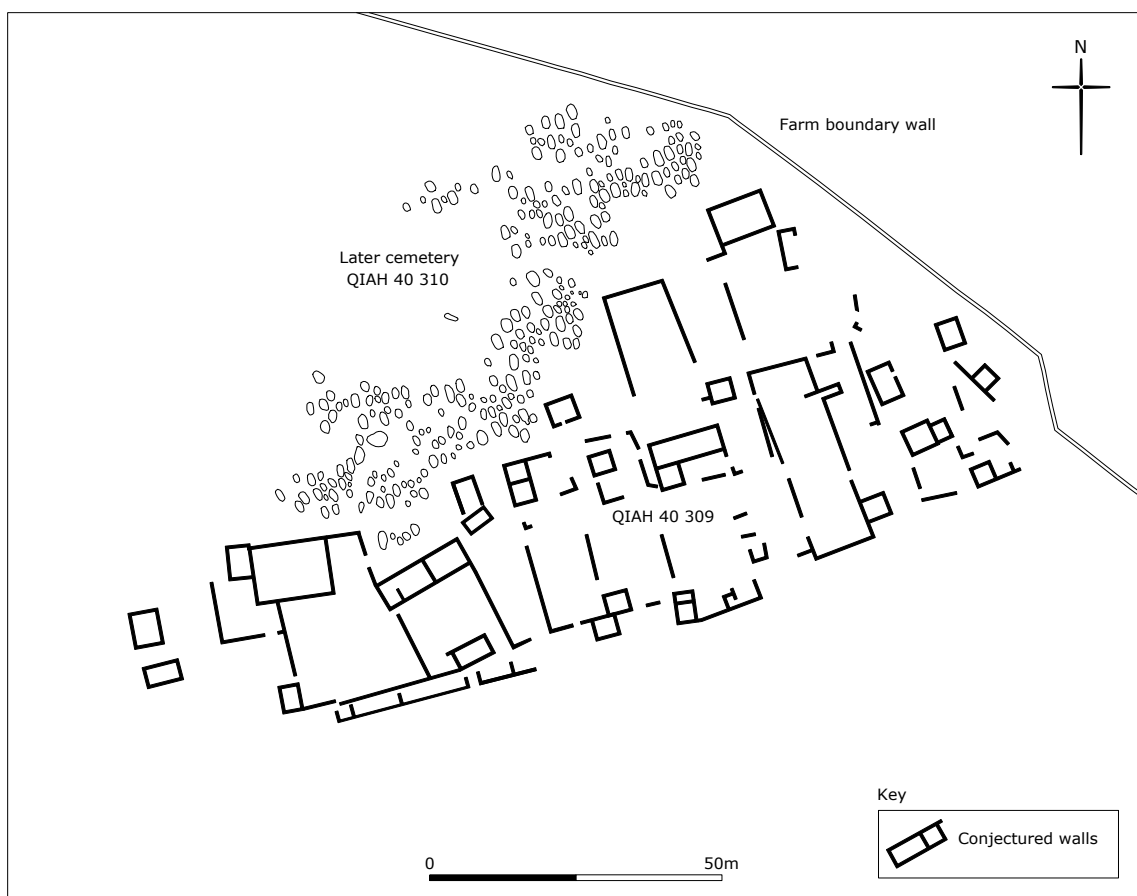


Figure 5.7: Musaikah A

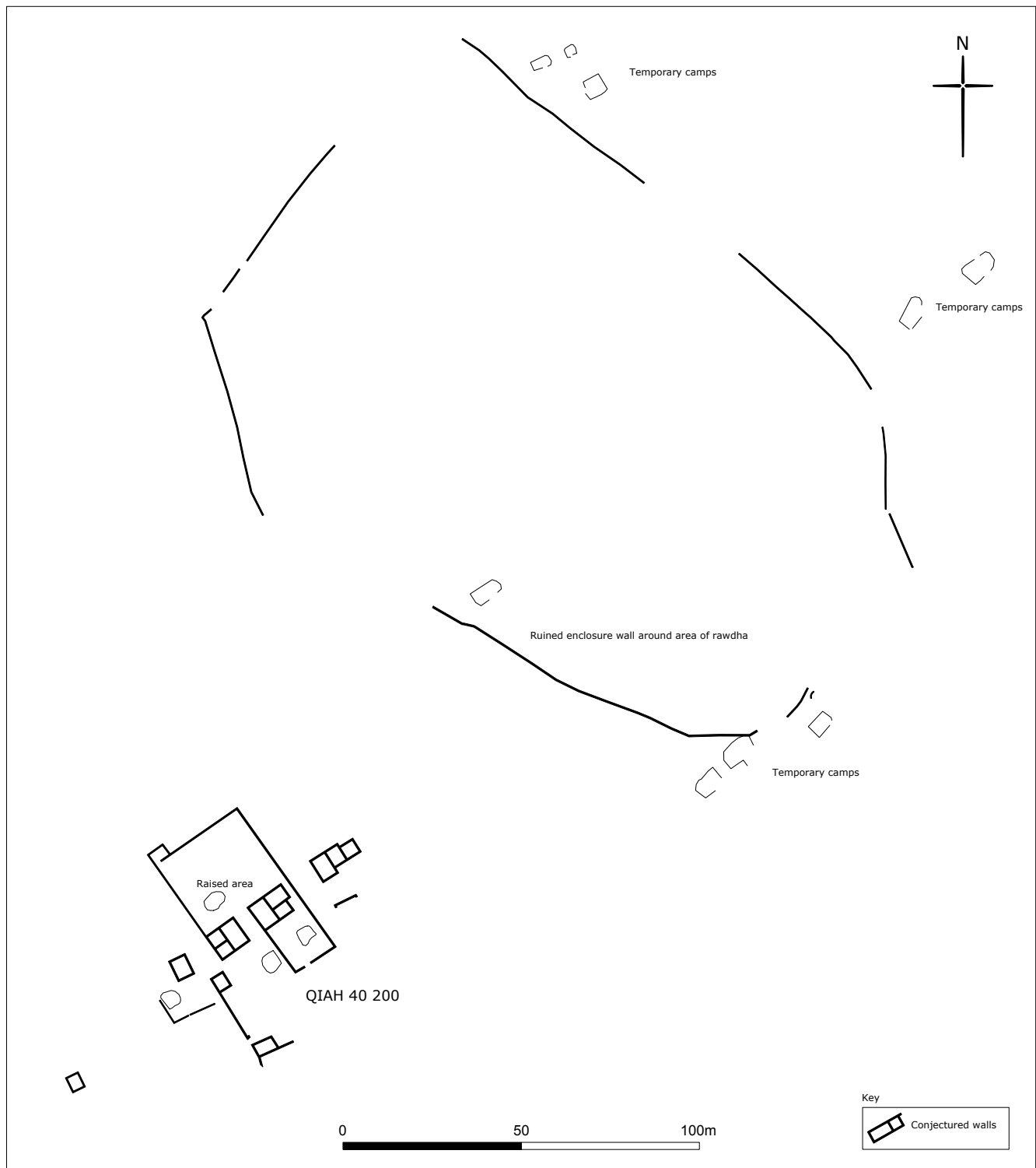


Figure 5.8: Plan of Musaikah B

north-west and may have once extended further north-east but has been truncated by the farm boundary wall. The site has a later cemetery (QIAH 40 310) located on the northern side (Figure 5.7).

Musaikah B, QIAH 40 200, QNHER 10378, (QNG 188786.624E/467349.509N)

The site lies on the western side of the present farm and consists of a linear group of four buildings, constructed on platforms aligned south-west to north-east. The two central buildings have one large room with two smaller rooms and share a compound or courtyard on the northern side, while the north-eastern building has an additional small courtyard on its south-east side. There are other small ancillary buildings, walls and four raised areas that look like natural features but some appear to have been levelled. To the north are the ruined remnants of an enclosure wall around an area of rawdah with a number of temporary camps positions (Figure 5.8). Beatrice de Cardi does not mention this site in her description of Musaikah and it is not known if this is contemporary with or later in date to the other sites.

Musaikah C, QIAH 40 120, (QNG 188203.475E/467889.914N)

The site is situated on the northern side of the farm boundary wall and is comprised of a linear group of 20 or more small structures aligned south-west to north east. Some are little more than raised platforms while others have fragments of wall and platform edges visible, but in general it is very hard to discern walls alignments within the rubble. The buildings are either square or

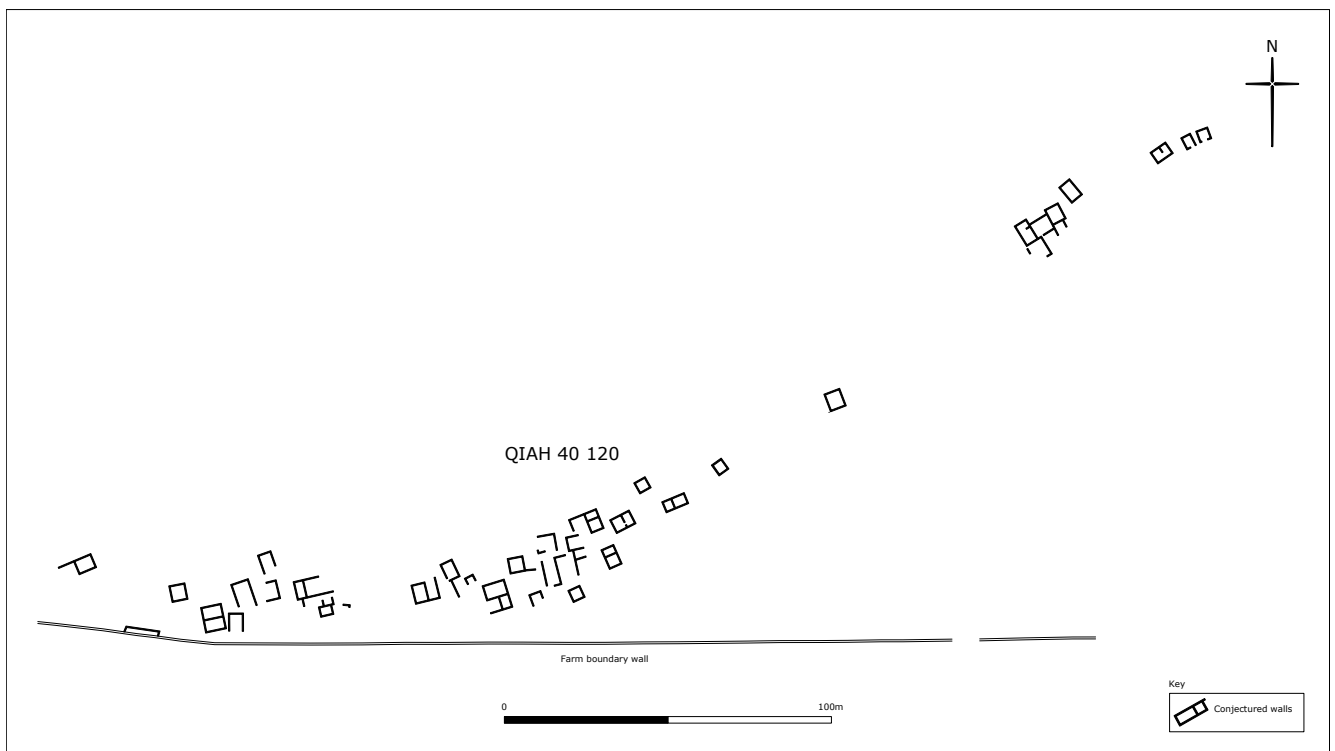


Figure 5.9: Plan of Musaikah C

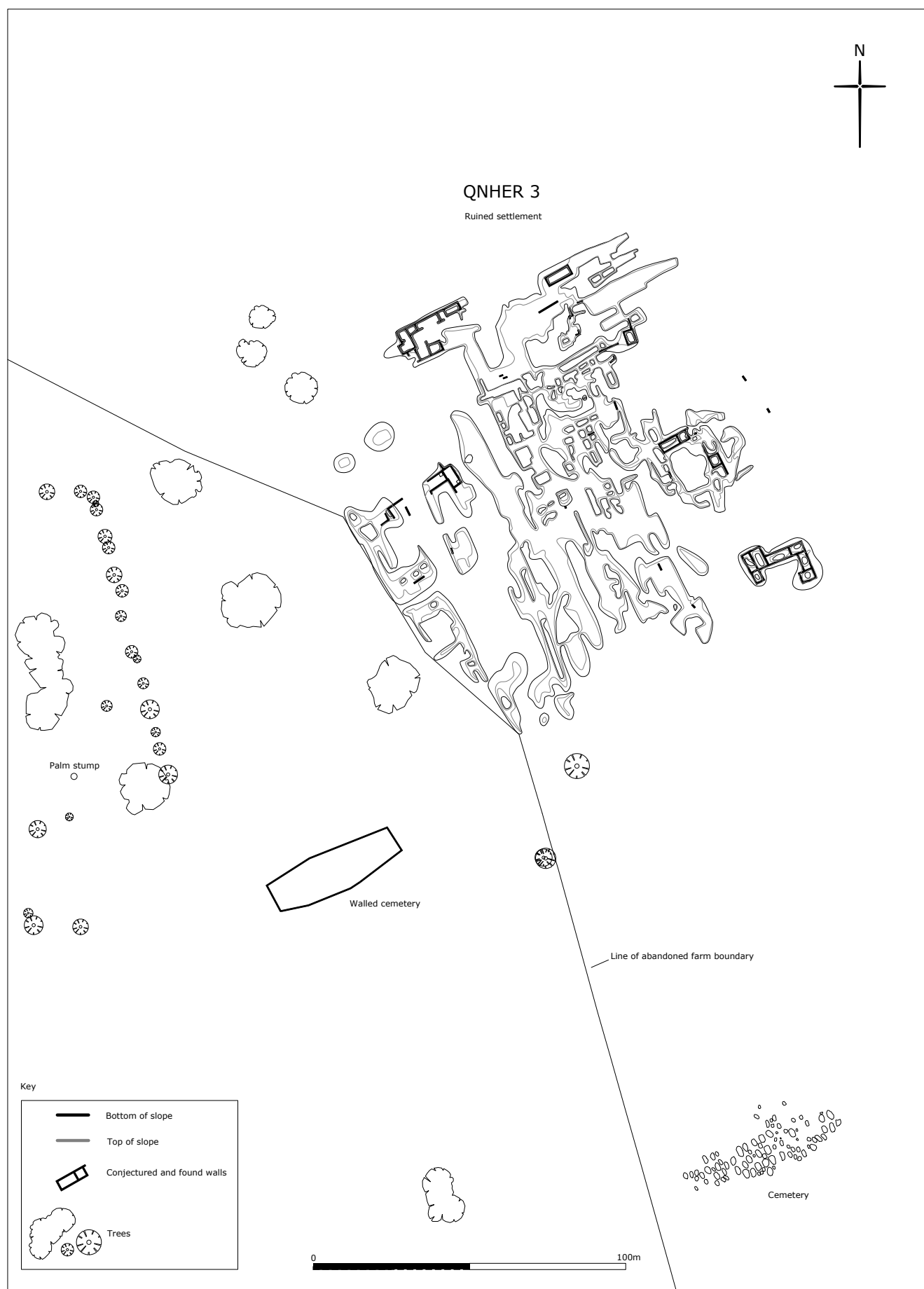


Figure 5.10: Plan of Helwan

rectangular in shape, some being further subdivided into two rooms. Unlike Musaikah A there are no large enclosures although some of the structures appear to have a small associated courtyard. Among the buildings are a couple of very weathered middens. The site may have extended further to the south-west but has been truncated by the farm boundary wall (Figure 5.9).

5.1.5 Helwan, QNHER 3 (QNG 184578.350E/466078.276N)

The site is situated on the higher ground north-east of a large irregular area of rawdah, covers an area of 140m² and includes a number of ruined stone buildings and middens. Unlike the sites at Musaikah A and the ruined settlement at Ain Mohammad, where the buildings form a line with a courtyard on one side, at Helwan the buildings are concentrated and are comprised of a series of rooms surrounding a central courtyard. Parts of the site have been mechanically graded so that large areas are covered with levelled material obscuring the layout. Although obscured the larger compound on the south-west side may be a fort and other courtyard buildings can be inferred. There are two cemeteries, a walled one located to the south-west of the site with the other situated to the south of the site. Material from the middens is very similar to that from Al

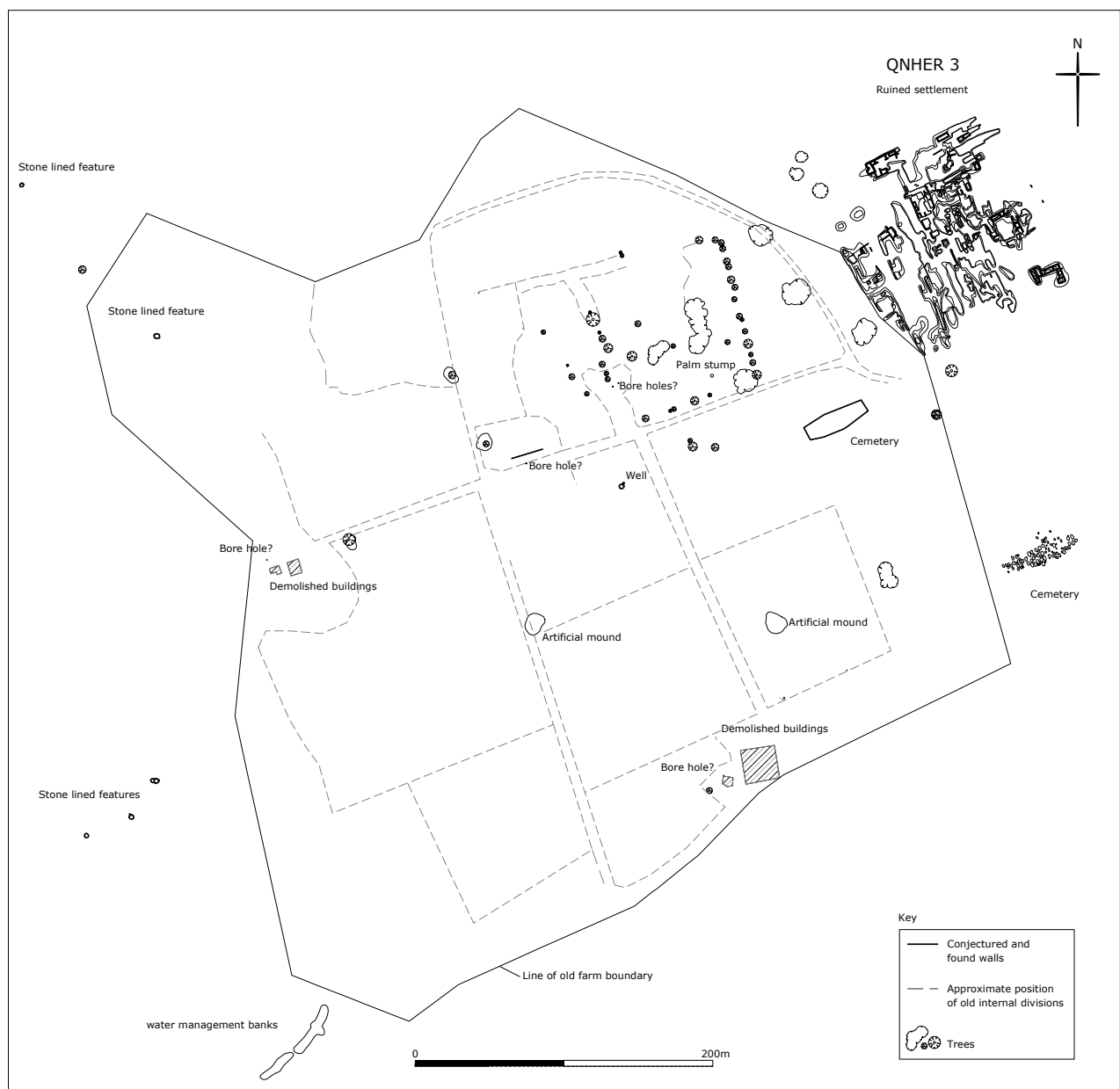


Figure 5.11: Plan of Helwan and associated rawdah



Figure 5.12: Plan of Muhayriqat

Zubarah (Figure 5.10).

Within the area of rawdah to the south-west there may have been more associated features to this settlement but the whole area has since been enclosed by a farm and subsequently abandoned (Figure 5.11). A 1958 aerial photograph as present for other surveyed sites has not been available for Helwan to date, and it will be interesting to see the area before the farm was established once a photograph can be sourced. Aerial photographs from 1963 and 1971 show the area under cultivation, with fields and buildings on the southern and western side and at least one near the centre. Only one stone-lined well capped with concrete remains situated roughly in the centre. Five small 0.45m diameter circular cuts were surveyed on the edges and near to the centre of the farm, close to the positions of demolished buildings. Some are capped and lined with concrete and others have a concrete or metal lining and it is possible that they are borehole positions or tannur ovens.

After the farm was abandoned the area has been extensively bulldozed and all of the buildings have been demolished and material has been pushed around the existing trees and along parts of the boundary. Today there are a few remnants of the fields defined by stumps from the bushes and palms that lined them while the main tree-lined area to the north-east still remains. The cemetery to the south-west of the site is now pedestalled suggesting that the ground level around has been reduced.

Within the farm area are two artificial mounds made up from stone and earth, have been described as towers, but neither of them has any obvious core or structure visible. Although the aerial photograph from 1971 is not of the greatest resolution neither of the mounds appear to show on the image. They could be spoil dumps from the clearance of the interior.

Along the western side of the former farm boundary are a number of small sub circular stone lined depressions situated on the higher ground, although one is situated in a one of the lower areas and it is thought that these are for storing fodder.

5.1.6 Muhayriqat QNHER 5 (QNG184184.380E/464810.803N)

This site is situated c.5.5km south-west from Al Zubarah and 1.3km south from Helwan on an area of rawdah. (Figure 5.12) The main feature of the site is a field system of at least 30 inter connected regular and irregular walled enclosures and 13 wells and associated spoil heaps. The settlement as such is comprised of a series of scattered ruined buildings mainly located along the northern side of the area, with one building to the south-west and another situated on a higher area to the north of the field system. The buildings are rectangular in shape and constructed on raised platforms, and some have small associated enclosures or cleared areas. The largest building is situated on the northern side and has a round tower on the western end and it is possible that this is a fort.

The northern end of the field system has been graded with a bulldozer which has either destroyed or covered some of the field system walls. All of the wells are disused and have silted up. On the northern side of the field system there is an artificial mound constructed from stone

and earth, larger than those at Helwan and it appears in all the aerial photographs, so this may well be the remains of a tower even though it has no obvious structure to it.

There are two cemeteries; a small one to the north and one to the south of the site, and scattered around the area of rawdah are a number of temporary camps of different periods. There are the remains of some demolished modern buildings and stock enclosures on the northern side.

5.1.7 Conclusion

All the sites surveyed this season show a continuity of use over time despite the changes brought about by the construction of modern farms as seen at Musaikah and Helwan. All of the sites probably have a phase of activity contemporary with Al Zubarah and at Musaikah two of the sites are believed to date to the Abbasid period, characterised by their linear settlements orientated south-west north-east. The ruined settlement (QNHER 10239) at Ain Mohammad is similar but it is not known if this is earlier in date to the rest of the site. Ain Mohammad was mentioned by Warden in 1850 as being contemporary with Al Zubarah and its other phases of activity are clearly visible up to the site's abandonment in the 20th century. There is no settlement similar to that found at Musaikah A at Helwan or at Muhayriqat and it is likely that they also had phases contemporary with Al Zubarah.

5.2 REGIONAL SURVEY

Daniel Eddisford

5.2.1 Introduction

An archaeological survey of northern Qatar was conducted between November 2011 and March 2012. The survey area consisted of the northern tip of the country, north of the major highways linking the site of Al Zubarah to Ras Laffan (Figure 5.13).

The regional survey project aimed to record the historic environment of northern Qatar throughout its human occupation. The goals of the project were to build a better understanding of the history of the region; to create a robust dataset that could be used as the basis for further investigations; and finally to enable the better informed protection and preservation of the historic landscape by the QMA.

The survey recorded 363 sites within the survey area, although a significant proportion of these are modern features and disturbances. The data collected was entered into a specifically designed GIS database. Several possible prehistoric find spots were identified. A number of rock carving were recorded on coastal aeolianite outcrops, although the date of these carvings is unclear. A relatively large number of sites consist of distinctive linear arrangements of small rectangular

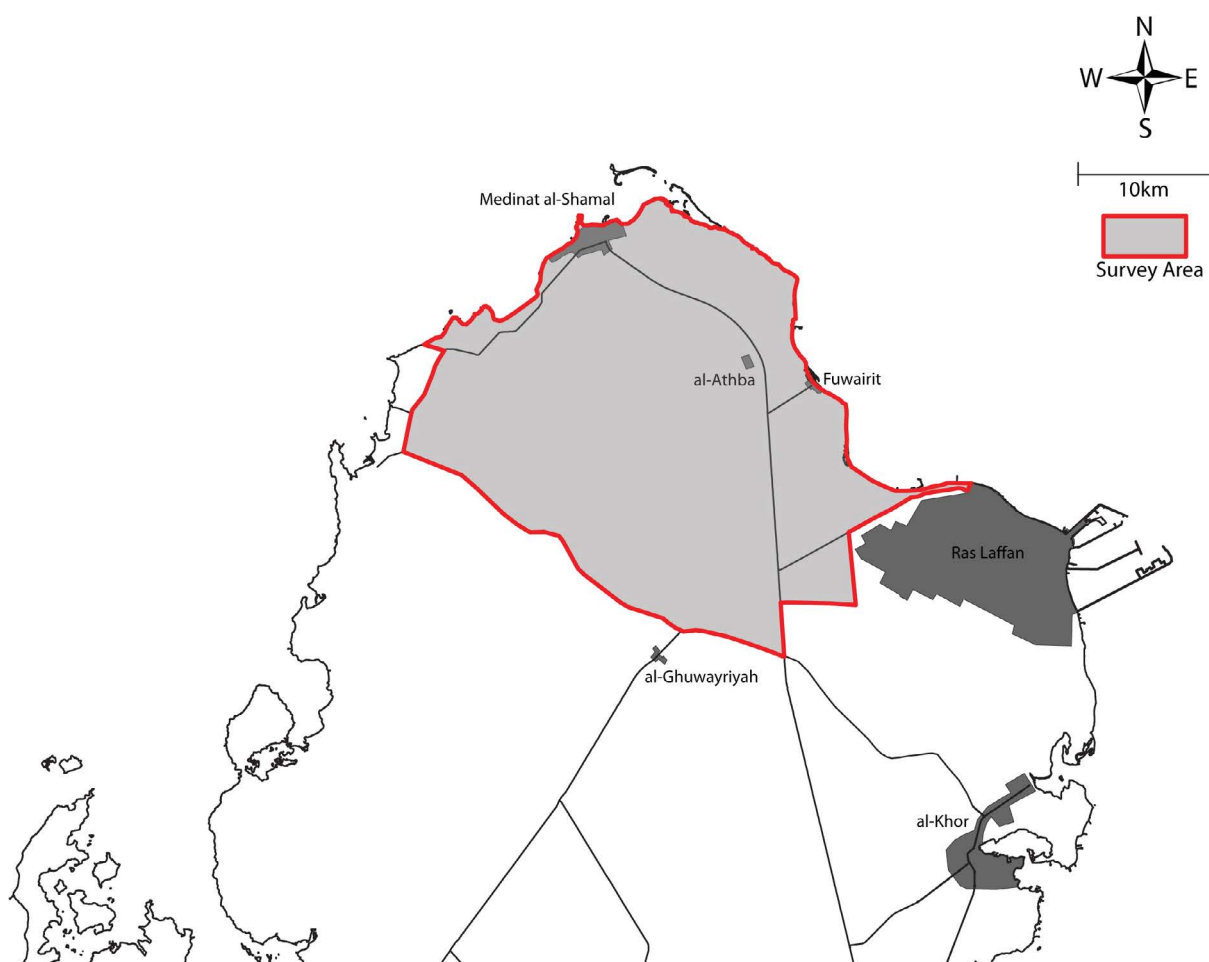


Figure 5.13: Area of the 2011-12 season survey

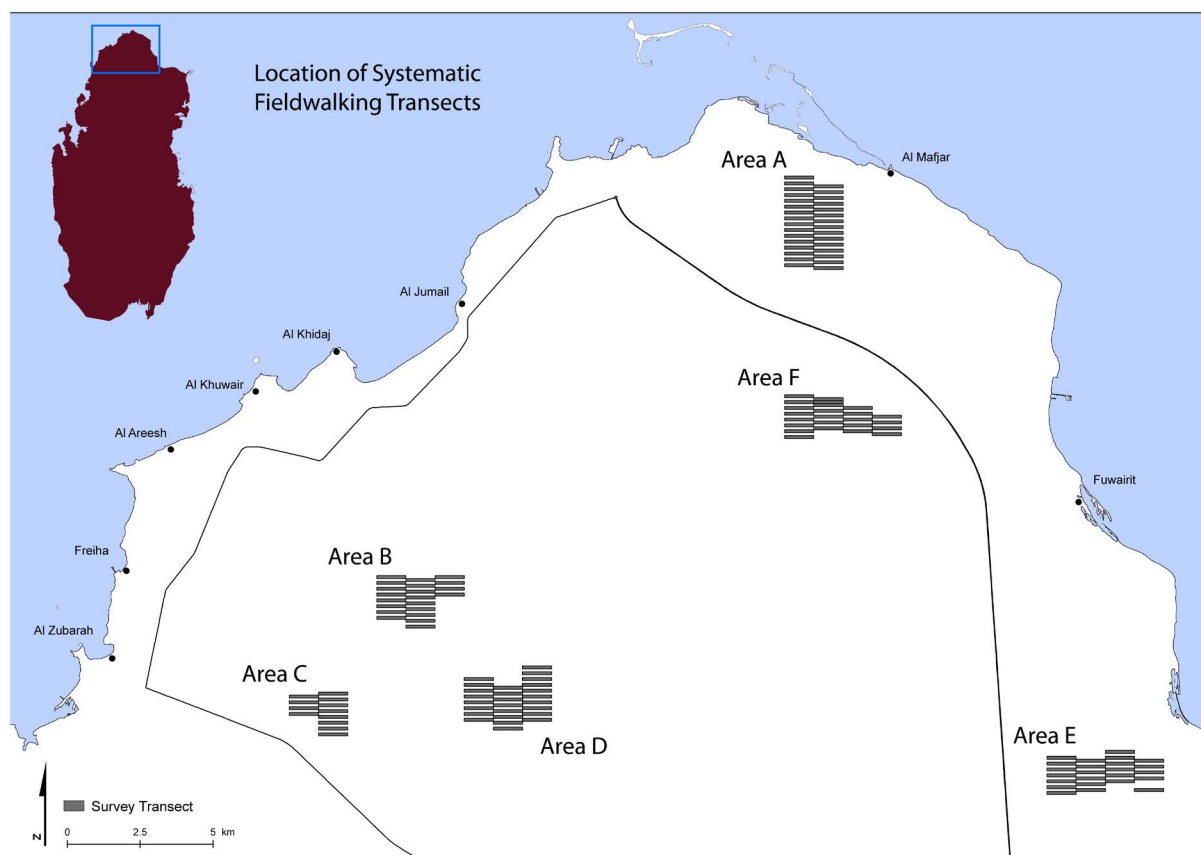


Figure 5.14: Areas covered by systematic fieldwalking

structures, all with an east-west or northeast-southwest alignment. The layout, architecture and surface finds at these sites all have clear similarities with the site of Murwab which is dated to the Early Islamic period (Guérin, and al-Naimi 2009; Guérin and al-Naimi 2010). Extensive evidence of later Islamic occupation was recorded, ranging roughly from the 16th century to the 19th century. A variety of different site types were identified including settlements, fortified structures, cemeteries, field systems, enclosures, wells and more ephemeral remains associated with nomadic Bedouin occupation in the area.

5.2.2 Methodology

Phase 1: Ground truthing sites

The initial phase of the regional survey consisted of ground-truthing possible sites identified from several sources. The main source of potential sites was the QNHER, a database of sites based on extensive examination of satellite and aerial photographic imagery (Breeze et al. 2011). Other potential sites that were ground-truthed include sites identified by previous archaeological surveys of the area (Kapel 1967, de Cardi 1978, Inizan 1978, Macumber 2011, Eddisford and Morgan 2011), as well as more informal observations made by team members.

A key aim of the survey was to cover a large area quickly, identifying and recording as many archaeological sites as possible. The level of recording undertaken reflected this goal; the aim being to locate each site in the landscape, briefly describe and document it, assess its age, and evaluate the potential of the site and the degree to which it is threatened. The minimum data

collected for each site consisted of a record of the site name; site location (QNG coordinates); site type; a site description and sketch plan; a provisional date for the site; the condition of the site; a risk assessment of the site; the geology, ground cover and land use of the area; at least one photo of the site. In addition surface artefacts were collected to assist in the dating of the sites identified.

Phase 2: Systematic field walking

A second phase of work consisted of a programme of systematic fieldwalking, intended to test the validity of the site distribution and range of site types that had been established. Six areas were targeted for more intensive survey (Figure 5.14). The fieldwalking methodology consisted of the systematic fieldwalking of one kilometre long transects, aligned to the Qatar National Grid. Each transect measured 100m wide and was walked by two team members. Each transect was sub-divided into ten segments, each 100m long, and the surface finds from each sub-division were collected separately.

5.2.3 Results

Prehistory

A limited amount of evidence of possible prehistoric activity was identified within the study area. Evidence of possible prehistoric activity consisted entirely of isolated surface finds of struck flint, with no evidence of structures of habitation identified. The raw material used for all the artefacts collected consist of a brown chert, which is found in some quantity on the surface at a number of locations within the survey area. The site of Helwan, although heavily disturbed by later Islamic occupation and modern irrigation, produced a number of struck stone artefacts, including a scraper with clear retouched edges (Figure 3, top left). Similar waste flakes and retouched flakes of brown low quality chert were recovered from Jabal Freiha.



Figure 5.15: Struck flint from Helwan (QNHER 3)

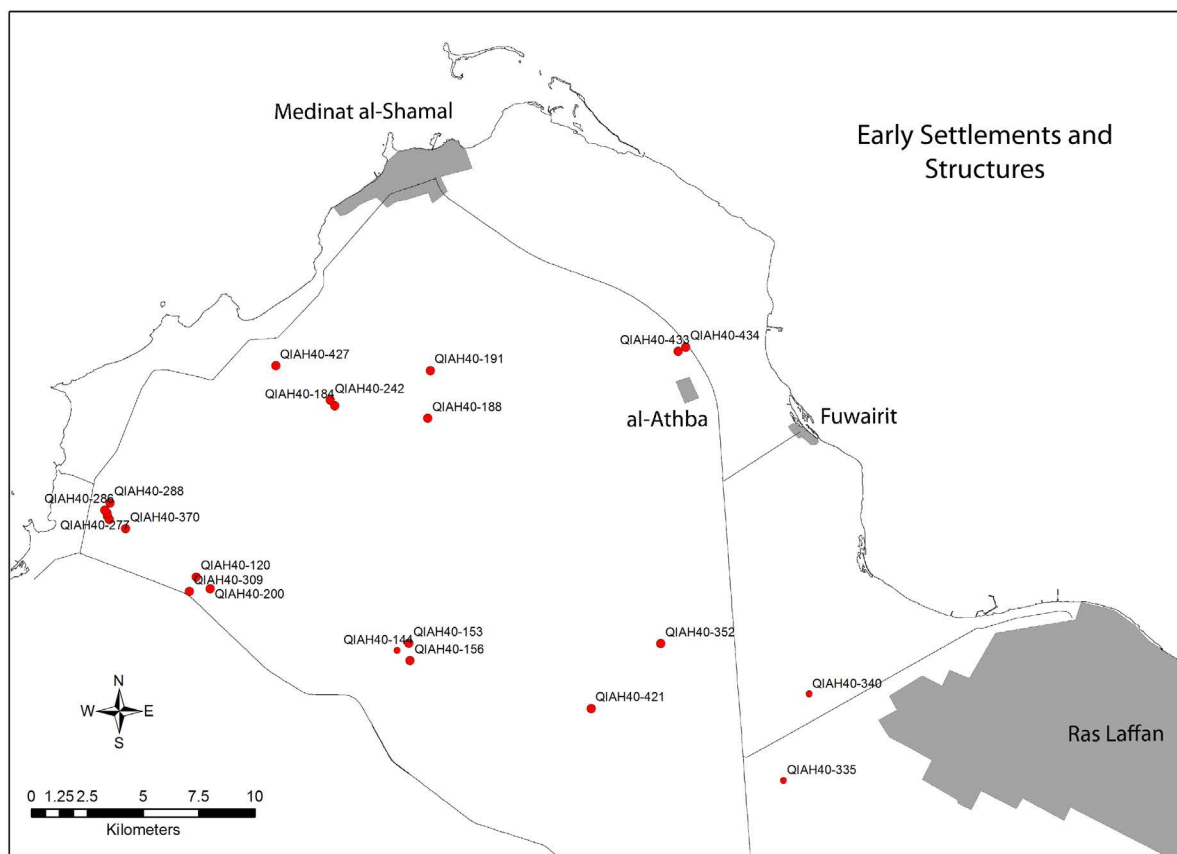


Figure 5.16: Distribution of early settlements and structures



Figure 5.17: Settlement QIAH40-276

Struck lithic flakes were occasionally found along the coast close to the 3m contour, which represents a raised Neolithic shoreline. Some of these find spots represent sites identified by the French survey of the area in the late 1970s (Inizan 1978). These finds are mostly waste flakes, however a small lithic assemblage collected near Ruwais during the 2010-2011 season, site QIAH40-435, includes retouched scrapers.

Early settlements and structures

The regional survey identified a number of distinctive linear arrangements of small rectangular structures, all with an east-west or northeast-southwest alignment (Figure 5.16). In addition several isolated structures were identified that are also probably of a contemporary date.

The sites of Musaikah and al Nehayy were identified by an archaeological survey undertaken between 2005-2006 (Guérin and al-Na'imi 2009). Guérin identifies a number of structures at these sites, and notes that "the ceramics collected on the surface...provide samples similar to those of Abbasid [9th century CE] Murwab" (2009: 182). Three separate elements to the settlement of Musaikah were recorded by our more recent survey, Musaikah C, Musaikah A and Musaikah B. These correspond to the northern and southern element of the site described by Guérin and al-Na'imi (2009: 182) as well as a large, and apparently previously unknown, courtyard structure directly to the east of the present day farm (See Fig. 5.14). At al Nehayy a large rectangular multi-celled structure, QIAH40-144, potentially represents a khan. Two groups of smaller structures, QIAH40-153 and QIAH40-156, are probably domestic dwellings.

At least four northeast-southwest aligned rows of structures, QIAH40-194, QIAH40-276, QIAH40-277 and QIAH40-286 were recorded close to the site of Al Zubarah (Figures 5.17 and 5.18). These rows of buildings appear to be contemporary, and consist mainly small single cell structures.



Figure 5.18: Aerial image of QIAH40-194



Figure 5.19: Fuwairit, QIAH40-231, from the air



Figure 5.20: Umm Al Qubur

Two alignments of similar structures were recorded at Al 'Athba, QIAH40-433 and QIAH40-434, however it seems likely that several more similar groups of structures are located around the present day settlement and associated gardens. Two similar alignments of structures were recorded at Makin (QIAH40-184) and (QIAH40-242), as well as at Umm Al Kilab (QIAH40-191), Umm Al Suf (QIAH40-188) and Rakayat (QIAH40-427). Several isolated structures appear to be contemporary with these settlements.

Later settlements and structures

Coastal settlements are abundant along the northern coast of Qatar, many apparently falling out of use in the later 19th century. The largest of these, QIAH40-168, measures over a kilometre long and may represent several different phases of occupation. On the east coast the settlement of Fuwairit, QIAH40-231, consists of a large number of walled compounds which again survive as low, partially buried ruins (Figure 5.19). Approximately 500m directly south of the archaeological site of Fuwairit a second settlement, QIAH40-360, is now also largely in ruins, was probably abandoned due to the salination of the aquifer in this area in the second half of the 20th century (see Macumber 2009). Inland from Fuwairit c.1.5km the site of Zarqa, QIAH40-359, represents a fortified site that would have provided the water and agricultural areas utilised by the former inhabitants of Fuwairit.

The site of al Huweila, QIAH40-437, was the most prominent town on the coast of Qatar in the 18th century. The town and the fort were recorded 1978 (Garlake 1978), but have been largely destroyed by various construction projects on the site. The central area of the site appears to be the least disturbed, and in this area the ground is covered with a dense scatter of 18th and 19th century pottery.

There are also a number of later Islamic settlements inland, often associated with wells and agricultural areas. The site of Umm Al Qubur, QIAH40-38, represents a substantial inland settlement with a number of structures built of mudbrick and limestone (Figure 5.20). Many of the structures have small rectangular air vents around the base of the walls, a common feature on later Islamic sites.

A number of homesteads, representing smaller agricultural settlements, as well as isolated structures were recorded. A rectangular structure, QIAH40-278, may represent an isolated domestic structure or an agricultural storage facility. The structure is located on an area of rawdah, close to well QIAH40-279 and field system QIAH40-280 (Figure 5.21).

Within an extensive field system QIAH40-225 at Umm Jassim several long thin buildings, QIAH40-186, have numerous internal divisions and could represent storage facilities. Between Jabal Jusasiyah and the coast a large mound, QIAH40-378, measuring 45m by 35m, has significant amounts of pottery on it and may represent a large buried structure. A similar buried structure, QIAH40-379, is located c.4km to the south east.



Figure 5.21: Walls of field system QIAH40-414



Figure 5.22: Walls of field system QIAH40-414

Field systems

Several field systems were identified, these varied in size but all consisted of units defined by low poorly preserved walls and associated wells. An extensive Field system at Umm Jassim, QIAH40-225, consists of a large number of fields and associated wells. A similar field system, QIAH40-414, at Muhayriqat consisted of a number of large rectangular fields, defined by ruined limestone walls (Figure 5.22).

Fortified sites

Fortified sites were often associated with wells, and are likely to have been used in part to protect water sources and associated agriculture. The sites of Qal'at Thaqab (QIAH40-143) and Qal'at Rakayat (QIAH40-219) have both been heavily restored relatively recently. The forts at Zarqa (QIAH40-438) on the northeast coast and Yusufiyah (QIAH40-167) on the northwest survive as ruins. The square fort at Qal'at Shwail (QIAH40-198) is associated with settlement QIAH40-196 and wells QIAH40-197. Most of the fort is constructed of limestone, however the larger northwest tower includes a heavily eroded mudbrick element; this tower survives to a height of 1.50m (Figure 5.23, refer to 2010-11 report for details).



Figure 5.23: Aerial view of Shwail fort QIAH40-198



Figure 5.24: Mud-brick tower near Makin



Figure 5.25: Possible animal enclosures QIAH40-105

On a small island off Lekhaire, accessible only at low tide, a large ruined fortified structure consists of two circular towers linked by a substantial wall, QIAH40-268. Near Makin, and possibly associated with the later Islamic settlement here, an eroded mudbrick tower, QIAH40-426, was constructed on limestone foundations and survives to a height of c.4m (Figure 5.24).

Cemeteries and graves

A considerable number of cemeteries and Islamic graves were recorded across the survey area and most of the settlements surveyed have one or more walled cemeteries associated with them. Other cemeteries are completely unprotected; often these features are not located close to former settlements and are presumably associated with nomadic Bedouin populations. These features may be the only surviving evidence of the associated temporary and ephemeral Bedouin occupation. As well as cemeteries a number of individual isolated graves were recorded.

Enclosures

Enclosure features, defined by stone walls or alignments of stones, are probably animal enclosures associated with pastoral farming (Figure 5.25). Other boundaries, defined by alignments of cairns, may represent property markers or other divisions of the landscape, for example demarcating the extent of an individual's or group's grazing rights.

Wells

The commonest type of hand-dug well encountered consists of a relatively narrow shafts lined with limestone and often rendered with grey concrete. This type of well often has one or more troughs radiating out from it. A second type of hand-dug well consists of a very large stone-lined rectangular pit, and would probably have required the fresh water to be skimmed off the top of denser salt water (see Macumber 2009). Large more recent wells, often with a distinctive keyhole shape in plan, are used as watering holes for herds of sheep and goats.

Temporary settlement and camps

The commonest site type recorded consist of temporary campsites associated with nomadic Bedouin occupation. These sites are characterised by having one or more cleared rectangular areas, representing tent sites. These areas were defined by low mounds of stones formed from the cleared material or alignments of larger stones placed around the edges of the clearing. The arrangement and size of these temporary camps sites varies, some consist of a single tent clearing and others have five or more cleared areas. In addition to the tent sites other associated features include temporary qiblah walls and a variety of rectangular or circular clearings; apparently associated with animal penning.

Cairns

A number of cairns were recorded in the survey area. These were a very common feature type, and not every cairn encountered was recorded. The cairns recorded have a number of functions, however most appear to be way markers or were used to mark Bedouin campsites. A single larger cairn, QIAH40-141, measures 9m in diameter and may be a burial cairn. The cairn is located close to an extensive prehistoric burial cairn fields to the south (Schreiber et al. 2009). An extensive cairn field was recorded near the area of Ruwais, QIAH40-274, the function of this site is not clear; however it is highly threatened by development and requires further investigation.



Figure 5.26: Rock carving on Jebel Fuwairit



Figure 5.27: Circular structures QIAH40-383

Rock Carving

The carvings on Jabal Jusasiyah, QIAH 40-377, represent the best known example of rock art in the country. This important rock art site has over 800 hundred rock carvings spread over an extensive limestone outcrop (Kapel 1983; Facey 1987). Similar carvings are present on Jabal Fuwairit, QIAH40-374, and Jabal Ghariya, QIAH40-330. The designs at both sites are comparable those Jusasiyah, and include parallel rows of cup marks and rosettes of cupmarks, which could boards for mancala-like 'capture' games as well as boat-like motifs (Figure 5.26).

Other features

A number of circular sunken structures were recorded in close proximity to a number of later Islamic sites. All of these features were located on raised areas of the limestone lithosol, close to and above areas of rawdah. These features measured 2m to 4m in diameter and were surrounded by a low limestone wall. They were recorded at a number of sites, including Muhayriqat (QIAH40-429), Helwan (QIAH40-410), Makin (QIAH40-428) and Umm Al Qubur (QIAH40-383). Some of the features consisted of a single circular structure; others had several circular 'rooms' within a single feature (Figure 5.27). These features may represent small circular enclosures intended to store animal fodder, a feature locally known as *mataben*. At Umm Al Qubur a local farmer, whose parents lived in the village, suggested they represent workshops.



Figure 5.28: Decorated ceramics from QIAH40-158 and QIAH40-309



Figure 5.29: Figure 17 sherds from QIAH40-434

5.2.4 Discussion

Within the regional survey area surface finds of struck flint artefacts were concentrated in intensity in the south west corner of the study area, notable in the vicinity of the site of Helwan and on the aeolianite out crop of Jabal Freiha. Other important prehistoric sites are known in this area (Al-Naimi et al. 2010; Cuttler et al. 2011). Elsewhere in the survey area evidence of prehistoric activity is sparse, consisting of occasional waste flakes.

Petroglyphs occur on most of the rock outcrops in the region, the soft nature of the exposed rock in northern Qatar make it ideal for pecking designs. Although sometimes thought to be of prehistoric date (Bibby 1965; Kapel 1983) the majority these petroglyphs are quite possibly of a later Islamic date (Hassiba et al 2012, Eddisford 2012). The function of many of the petroglyphs remains unclear, however the repeated occurrence of linear and circular arrangements of cupmarks are likely to represent game boards for a mancala-style 'capture' board game.

The presence of distinctive turquoise glazed decorated jars on sites in the Arabian Gulf has frequently been used as an evidence of Early Islamic occupation. This monochrome green-glazed ware is characterized by a yellow fabric and a translucent turquoise glaze, often with applied or incised ornament. The best-known type is a large jar with barbotine decoration, examples of which are known from Samarra, Susa, Siraf, and other sites (Lane 1947; Whitehouse 1979).

Similarities between the surface assemblages at Musaikah and al Nehayy and excavated 9th century ceramic assemblage from Murwab have been noted by Guérin and al-Na'imi (2009). Distinctive decorated sherds from the early sites identified in this survey include barbotine decoration of rosettes, each composed of a triple circle of dots; ribbed internal and external decoration with a thinner more bleached glaze; incised wavy lines and incised grid patterns (Figure 5.28 and Figure 5.29).

The existing QNHER dataset was an invaluable tool in rapidly building a high resolution picture of the various site types in the survey area. The survey has highlighted problems with QNHER, but will also allow this data to be interpreted in the future with a greater degree of confidence. The QNHER data omits some sites, such as the settlements of Umm Al Kilab (QIAH40-191) and Al 'Athba (QIAH40-433 and QIAH40-434).

Further intensive field survey is required to support the preliminary site distributions presented in this survey. However, given the low density of sites in much of the survey area this needs to be undertaken in a sensible manner that maximise the return and minimises manpower. Key to this will be the development of a more robust integrated survey database and GIS data set, which will allow predictive modelling and more reliable statistical analysis of the data. In addition the more intensive recording of many the sites identified in this survey is required, both through total station survey and more intensive on-site documentation.

6. FINDS AND CONSERVATION

6.1 FINDS MANAGEMENT 2011/2012

Holly Parton

6.1.1 Introduction

This season the finds laboratory undertook and achieved five key objectives:

1. The processing of all new incoming finds.
2. The selection of objects for display in the new National Museum of Qatar.
3. An increase in the volume of object conservation with special priority given to Freiha coins, National Museum of Qatar objects and beads.
4. The implementation of a closed, 3-barrel flotation tank allowing the full-time processing of soil-samples.
5. The provision of additional storage and working space.

6.1.2 Incoming Finds

With excavations at the three major sites of Al Zubarah, Freiha and Fuwairit and the extensive ground survey there was a marked increase in the number of finds this season. A summary of the overall totals are as follows:

Bulk Material – 3599 bags.

Field Objects – 920 of which 607 have been catalogued.

Samples – 1335 of which 985 are soil-samples for flotation.

The following table gives a breakdown by site with the bulk bags also divided into the six main material categories. Glass bracelet fragments are found in sufficient quantities to warrant them being classed as bulk, with only complete or almost complete examples now made field objects. The different quantities reflect both the individual site sizes and the extent of excavation carried out at each. For example at Al Zubarah, the largest site, four areas were excavated whilst at Fuwairit, also a large settlement, only preliminary excavations were done in the latter half of the season.

FIND CATEGORY	ZUBARAH	FREIHA	FUWAIRIT	SURVEY
Bulk Ceramic	584	443	48	234
Bulk Bone	520	310	41	0
Bulk Metal	197	146	26	0
Bulk Glass	112	102	16	51
Bulk Shell	121	262	31	4
Bulk Glass Bracelet	49	6	22	59
Field Objects	462	311	23	124
Samples	579	721	35	0

6.1.3 Selection of objects for the National Museum of Qatar

The National Museum of Qatar requested an initial selection of objects for potential display in the new museum. This became one of the key priorities of the season. Objects were selected not simply for their aesthetic, visual impact but according to various display themes that could be used to tell different stories. By the end of the season 156 objects had been chosen from the different sites covering the topics of architecture, household, industry, diet, food storage, fresh water, commerce, trade, pearling, fishing, personal items, decorated objects and children. The majority were conserved, catalogued, drawn and photographed. A few still require full conservation and these will be the first priority in the following season. In October 2012 a further 46 objects were selected, including worked stone (anchors, diving weights), decorative architectural elements, large size ceramics and a collection of stone tools. In total, 202 objects have now been designated for the new National Museum of Qatar.

6.1.4 Conservation

Four conservators worked on three priority areas: Freiha coins, objects selected for the National Museum of Qatar, and beads. The latter was a specific project undertaken by Dr. Franca Cole, a specialist in this area, who conserved and catalogued 156 beads, including the natural pearl bead from Freiha, FREP04, Locus 1017, catalogue number 240, (Figure 6.1). It is an interesting example as it has bands of calcareous material resulting from discontinuous growth. These have been incorporated into the shaping of the bead however so that they form almost a decorative feature. This season also saw the full conservation of the pearl merchant's box from Zubarah.

Another interesting object listed for the National Museum of Qatar is a copper alloy Jeton (counter) from Al Zubarah. It has a small perforation that obscures some of the markings, but careful conservation has revealed a sun, seven stars, crescent moon and the letters E. L. S. LAUER and RECHE R/N_FEN on the reverse and on the obverse a ship with the letters PLUS UL_ and I.L.S.L. Research so far indicates that the Lauer family were the last makers of jetons in Nuremberg, Bavaria, in the late 18th - early 19th century. Our jeton bears the initials of Ernst Ludwig Sigmund Lauer whilst the other word on the reverse is probably 'Rechenpfen(ning)' being German for jeton and on the obverse Plus Ul(tra) is probably the family motto (The Fitzwilliam Museum in Cambridge (UK) has a number of jetons in its collection that offer close parallels. Museum Accession Numbers: CM.2469-2003, CM.2471-2003, CM.2472-2003, CM.2473-2003. <http://www.fitzmuseum.cam.ac.uk>).

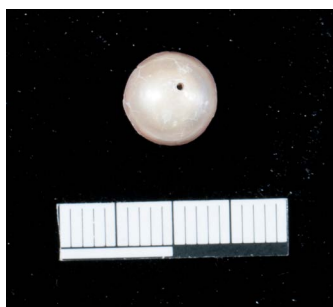


Figure 6.1: Pearl Bead FREP04, Locus 1017, Catalogue Number 240



Figure 6.2: Pearl Merchant's chest



Figure 6.3: Copper alloy Jeton, ZUEP01 Locus 1116 Catalogue
number 323, L. Reverse R. Obverse

6.1.5 Processing of Soil Samples

With the water supply coming from a storage tank rather than being a constant flow a closed system that uses less water is necessary. A three barrel flotation tank was built. The water is pumped round continuously but having two extra tanks allows the sediment to settle so that no contamination occurs. The barrels are emptied daily and filled with fresh water. The priority this season was Freiha from where 721 soil samples have been taken, most consisting of one bag but with several between two and six and even nine bags in one case. Nearly all of these samples were processed this season, a super human effort on the part of Dr. Murray, the project environmental specialist, and the findings are already proving of major research importance.

6.1.6 Provision of Extra Storage and Working Space

With the increase in finds and the people processing them additional work and storage space was needed. Four shipping containers were installed at the QIAH Zubarah Research Station. Two large ones are used for storing bulk finds, providing a sealed environment against animal and bug intrusion. Two smaller containers are used as workrooms, one for drying finds, and one for residue sorting. The containers have been insulated with cladding against the extreme high temperatures in the summer. A small freestanding building was also delivered which will be fitted out as the new conservation laboratory next season.

6.1.7 Conclusion

In addition to achieving the five main goals outlined above the study of the ceramics and fish bone continued as well as the drawing and photography of catalogued finds. The illustration of the fishbone reference collection for publication was also started.

6.2 PRESERVING THE PAST - CHALLENGES IN CONSERVATION

Anna Tjelldén and Marianne Schwartz (Moesgård Museum, Denmark)

6.2.1 Introduction

The 2011-2012 season saw a team of international conservators from Denmark, Greece and the United Kingdom working at the Al Zubarah Research Station and in the laboratory of the Qatar Museum of Islamic Art. Many different materials were taken care of, including objects in ceramic, ivory, bone, various metals, glass, stone and wood. All treatments were tailored to the needs of the individual object but there was frequently a need to minimize deterioration caused by salts in the soil due to the location near the sea. When salts crystallize within an object, cracks occur and, in the worst case, the entire surface detaches. A high proportion of artifacts needed desalination in order to slowly wash the salts out. If great care was not taken, the artifact would risk falling apart, owing to the only thing holding it together being the salt itself. An integral part of the conservation work this season included the packaging and storage of objects, both treated and untreated, in order to provide a stable storage environment.

6.2.2 Conservation Treatments

Ceramics

The surface of many decorated sherds were in danger of fragmentation and disintegration because of salts. In order to maintain the fragmented, glazed surface it was necessary to brush clean it dry, lacquer the surface and then desalinate it in distilled water. Subsequently a second lacquering/impregnation was introduced to hold the fragile ceramic together (Figure 6.4).

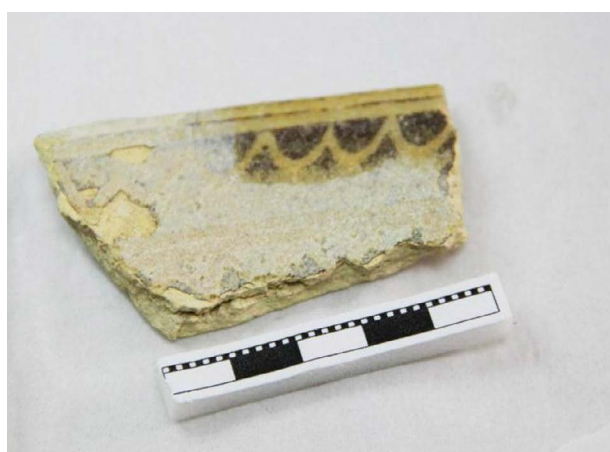


Figure 6.4: The deteriorated surface of manganese painted, alkaline glazed ware. Patterns are visible when introducing it to water or lacquer.

Ivory

The following is a summary of the delicate conservation treatment needed for a fragmented object of worked ivory suffering from extensive salt activity.

Surface salt crystals are removed mechanically, using a scalpel and bamboo skewer. Loose crystals are brushed away. The surface is swabbed with ethanol to remove loose, powdery deposits, before air-drying. Re-deposition of surface salt became visible after three days so it was decided desalination would be needed if item was to survive intact, as the flaky area of the base was determined to be held together by salts only. This was bound in place by adhering strips of blotting paper to solid areas of the base using HMG Paraloid B-72 adhesive, and covering the flaky surface with multiple strands of human hair (Figure 6.5).



Figure 6.5: Consolidation of ivory object FREP04/426, Catalogue No. 146

Internal armature was produced to prevent internal surface loss while desalinating, while allowing salt migration. Object cavity was lined with cling-film, then a cage structure of blotting paper strips was adhered inside the space using HMG Paraloid B-72 from a tube. This was allowed to harden, then was removed, and the cling-film cut away from the spaces. The armature was repositioned inside the cavity.

The remainder of the artefact was bound first with human hair, then corners and fragile areas were padded with blotting paper and the whole was bound together using bias-cut nylon netting strips knotted into position. This gave lightweight, solvent and water permeable compression to all surfaces of the artefact, while enabling free solvent and water movement. The object was next immersed in 96% ethanol for one hour, then distilled water was added in a combination of 85% ethanol and 15% water.

10% total volume of the solution discarded and 10% distilled water added three times daily for three days. The item was subsequently transferred to distilled water, removed, blotted with tissue to remove excess water, then immersed in 50:50 ethanol: water. After three hours, it was removed, blotted with tissues to remove excess solution, then immersed in 96% ethanol. Ethanol dewatering repeated three times daily for two days. The item was then moved to 50:50 acetone:ethanol solution for six hours then removed, blotted, and placed in pure acetone. Acetone washes were repeated three times. Item then transferred to 5% solution of paraloid B-72 in acetone. After twelve hours, 40% Paraloid-B-72 added to the original solution to produce a 10% solution. Left for twelve hours. Removed, dried in an acetone vapour environment for twelve hours, then left to dry in air for twelve hours. Surface wrappings are removed. The surface was swabbed with acetone to remove excess consolidant and re-deposited sediment, before being reconsolidated with 3% solution of Paraloid B-72 applied with a soft brush. This is then air dried. Fragments are adhered with Paraloid-B-72 (Object following conservation, Figure 6.6).



Figure 6.6: Ivory object after conservation,
No. 146, OD-6937

Catalogue



Figure 6.7: Working shot: coin prior to conservation



Figure 6.8: Working shot: bronze object prior to conservation



Figure 6.9: Lacquering the metals under vacuum

Metal

As bronzes are highly sensitive to salts in combination with fluctuating humidity, the surface of many objects was highly corroded (Figure 6.7 and Figure 6.8). The conservation of objects such as coins, jewelry and tools included mechanical cleaning under microscope using scalpel and ultrasonic dental chisel. Then lacquering with *Incra lacquer* was necessary in order to prevent the artefact from further corroding (Figure 6.9).

Composite objects in wood, metal and organic materials

A conservation project of high priority was the pearl merchant's box carried out at the Museum of Islamic Art. After cleaning the wooden surface with its bronze decorative elements and remains of red dyed textile using brushes and tools, it was crucial to stabilize the box by slowly impregnating it with consolidant (Figure 6.10, and after conservation: Figure 6.2). For a detailed report on conservation of this object, see document QIAH-0101F002 "The Pearl Merchant's Chest. Conservation report", by K. Tsatsouli.

Packaging and Storage

The correct packing and storage is essential for object preservation. This season textile fragments were packed with the RP System with an oxygen scavenger and an oxygen eye in each Escall bag. Organics and fragile objects were packed with acid free tissue paper in boxes. Metals were stored with silica gel and humidity indicator cards and some were vacuum-packed. These steps are necessary in order to prevent the excavated and untreated objects from deteriorating in the aggressive climate of Qatar. The conservators of following seasons will continue the professional care and knowledge necessary to preserve the past of Al Zubarah for future generations.



Figure 6.10: Pearl merchant's box during conservation

7. ARCHIVAL MATERIAL RELATED TO LATER ISLAMIC AL ZUBARAH

Hanne Nymann

7.1 INTRODUCTION

There is no single historical source that explains why or how Al Zubarah was established. Rather, understanding the history of Al Zubarah requires an analysis of a broad range of historical and archival sources in order to understand the context, in which the town was conceived, grew and ultimately succumbed. Potentially relevant archives, repositories and manuscripts have been collated. This section provides a short overview of this work, listed according to the main language of the source.

7.2 OTTOMAN SOURCES

The Başbakanlık Osmanlı Arşivleri, Istanbul, is one of the largest archival holdings in the world with nearly 100 million documents. Material from here should in theory provide an Ottoman perspective on developments in the Gulf, developments which previously were much influenced by British Gulf historiography and the idea of hegemony of European powers (Fuccaro 1999; Valenti 2011). Regrettably, the Ottoman administrative archives from Nejd and Hasa, kept in Baghdad and Basra respectively, have been destroyed and very few documents related to the Gulf in the 18th century are thought to have survived (A. Meier pers. com.). Ottoman influence on the area of Eastern Arabia in the second half of the 18th century was negligent, although they kept a theoretical claim to it until 1870.

The Hijaz portfolios kept at the National Archives of Egypt is a rarely used source on the development of the first Saudi state, as seen from an Ottoman perspective, and could offer insight into the expansionist politics that implicated Al Zubarah from 1790s.

7.3 ARABIC SOURCES

Only a few primary Arabic sources have been identified so far, foremost amongst here the so-called Wahhabi chroniclers. Forthcoming work will focus on Ibn Bishr Unwan's *al-Majd fi Tarikh Najd* (1854) and Ibn Ghannam's *Rawdhat al-Afkar wal-Afham*, which ends in the year 1797. The anonymous *Kitab Lam' al-Shihab fi Sirat Muhammad ibn 'Abd al-Wahhab* (1817) which until recently was considered a Wahhabi chronicle was most likely commissioned by the British officer Robert Taylor (Davies 1997: 132). It contains several specific references to Al Zubarah and is a near-contemporary source of great importance.

Another promising source is 'Uthman Ibn Sanad, *Saba'ik al-'Asjad fi Akhbar Ahmad Najl Rizq al- As'ad*. This book, written in the 19th century, is a biography on one of the wealthy pearl merchants that partook in the founding of Al Zubarah. Of particular interest are the references to religious and scholarly life in Al Zubarah (Fattah 1997: 27).

In the 1780s Al Zubarah merchants began to supply the inner Arabian tribes with commodities, especially coffee (Manesty and Jones 1791). Another potential source is therefore *Kitab tarikh kayf kana dhuhur Shaik al-Islam Muhammed Ibn Abdul-Wahhab*. Most likely written around 1803 by a Nadji merchant, this manuscript offers information of inland trade in Eastern Arabia (Fattah 1997: 68).

The destruction of local archives and private collections has been intensive and often oral histories are the only source of information. Unpublished family archives, especially of local (Eastern Arabia) native East India Company agents, still exist but it is a difficult task to locate these (Onley 2007: 5-7). This material is particularly valuable as recent historical research, inspired by revisionist approaches, tends to highlight the economic dimension of local groups (Abdullah 2001; Segal 2009).

For various reasons there is a dearth of Qatari documents (Anon. 1998: 6), particularly before 1820 (Tuson 1991).

The Zanzibar National Archives (ZNA) holds a rich collection of documents from the era of Omani rule (1800-1890) that until now has been overlooked by Persian Gulf researcher (Bang 2008: 349). These contain essential details on Arab trading diasporas in the Indian Ocean and their role and relations to mercantile dynamics in the Gulf region. Despite fluctuation on the political relationship Omani Muscat was an important trading partner. The archives may also provide more information on the Omani dynasty's shifting attitude to the Khalifa Utub, as well as the attack on Al Zubarah in 1810.

7.4 DUTCH SOURCES

When the Dutch East India Company went bankrupt in 1795, the Dutch state inherited their archives, leaving a large coherent material of which a large portion is kept at the National Archives of the Netherlands. The material is particularly informative on the condition in the Persian Gulf prior to the establishment of Al Zubarah but less so after 1766 where the company left the Gulf. This is evident in the works of Ben Slot and Willem Floor who until 1757 use Dutch sources but thereafter mainly British ones. The reports by Tidlo von Kniphausen from the 1750s are particularly informative about the history of the Utub (Floor 2007). This material is presently being digitalized.

By far the largest archive on Dutch interaction with the Indian Ocean world is the central administrative archive in Jakarta. In contrast to other company archives, the archive was not discontinued in 1795. The archive is not digitalised and has to my knowledge never been used in connection with Persian Gulf research.

7.5 INDIAN SOURCES

An important Indian document of the late 18th century is the *Waqai-i Manazil-i Rum*: diary of a journey to Constantinople (Hasan 1968). In 1786, Tipu Sultan, the Muslim ruler of Mysore, southern India, made attempts to expand his diplomatic and commercial network into the Persian Gulf and therefore sent a group of diplomats. One of these, Abdul Qadir, kept a diary which has survived in the *Waqai-i Manazil-i Rum*. The journey took them by ship via Muscat to Bushire and then to Basra via Kharg Island. The *Waqai* contains geographical inaccuracies which might be a result of Abdul's reliance on informants (Brittlebank 2005: 210). The text is only available in Farsi with an English summary that not always follow the structure of the Persian text (Brittlebank 2005: 211) and Al Zubarah is mentioned briefly as an important pearl fishing town (translation provided by Claus Pedersen). Despite this, it provides valuable information on customs and local conditions, albeit to a lesser degree in the Eastern Arabian area.

After the conquest of Bahrain, the Khalifa Utub had direct commercial ties with Surat, Gujarat. Further research into archival material from this area therefore seems relevant. However, present research on Indian traders tends to rely on European sources (Nadri 2008), perhaps an indication of a lack of local sources.

7.6 BRITISH SOURCES

The primary source for the Persian Gulf and Qatar are the archives of the East India Company (EIC). Although a private company the EIC often acted as a state institution, assuming diplomatic and military functions and the material therefore contains a variety of information. There are two main repositories of EIC material that relates to the factories (trading stations) of Gombroon (Bandar Abbas), Bushire and Bussora (Basra): the India Office Records (IOR) in London and the Maharashtra State Archives (MSA) in Bombay. IOR are administered by the British Library, London, and deposited at the Asia Pacific & Africa Collections.

Contrary to other India Office material the Persian Gulf records do not contain a basic core of records actually produced and maintained at the factories concerned. The series is made up of various materials relating to Persia and the Persian Gulf that appear to have accumulated in London (Tuson 1979). The central groups of IOR records relevant for Al Zubarah are the so-called Gombroon Diaries (reference numbers G/29/1, G/29/4, G/29/6-14) and the archive of the British Residency at Bushire (R/15/1/1 - 13) which covers the period 1763-1813. Of particular interest is G/29/25 (Report on the British Trade With Persia and Arabia, 1791) which have two short sections dedicated to trade at Al Zubarah.

All historical material presently held at the India Office that concerns the Gulf is in the process of being digitised, courtesy of the British Library and sponsored by the Qatar foundation. A fully searchable web-site will be available from 2015 which will facilitate research immensely.

The MSA archive contains records from EIC Bombay administration including several papers relating to political history. Of particular interest are the Bussora (Basra) and Gombroon Factory diaries. A closer look at this archive is of interest as it apparently contains material not used systematically in modern research. A selection of very central records on Eastern Arabia was compiled and edited by Hughes Thomas, 1856, and reprinted by Oleander Press in 1985. It contains information that Lorimer only partially included in his *Gazetters*. The latter has since its declassification in 1970 been the most used secondary source for the 19th century history but contains very little material on the 18th century. MSA is housed in Elphinstone College Building, Mumbai, an open-air structure built in 1888. As a result the archive is not in an optimal condition.

Approximately 11000 photocopied pages selected from the Bombay Secret and Political Department Diaries for the years 1778 – 1820 are kept at University of Exeter.

In 2009 Sotheby's auctioned off a collection of private papers belonging Harford Jones (later Sir Harford Jones-Brydges) who served the EIC in Basra and Baghdad before becoming ambassador to Persia. The archive covers the period 1783-1811 and therefore relates to the last 27-28 years of Al Zubarah's history. More than 3100 items document diplomatic and military events and offer invaluable insight into language, customs and trade. Sold for £217000, its present location is unfortunately unknown (<http://www.sothebys.com/en/auctions/ecatalogue/2009/english-literature-history-children39s-books-illustrations-l09773/lot.6.html>, accessed 1. Nov 2012).

7.7 OTHER SOURCES?

There were Jewish, Armenian and Indian trading communities present in the Gulf but little is known of them outside Basra, although an Indian group had resided at Bahrain since the seventeenth century (Abdullah 2001; Segal 2009; Markovitz 1999). Persian chronicles relate occasionally to Gulf events but are often unclear and of limited value (Tucker 2012). Apart from the 17th century Carmelite sources few reliable French sources have so far been identified. Billecocq (2008) only identifies two 18th century French sources, both minor travel reports.

7.8 CONCLUSION

The Eastern Arabia Gulf settlements and hinterlands consisted in the 18th century of a diverse group of people bound together mainly by ties defined by genealogy or commercial partnership (Anscombe 2005). Various tribal identities existed side by side, both nomadic (*badu*) and settled (*hadar*) (Zahlan 1979:16). Sunni tribes adhered to various religious schools and Shi'a populations were present in Bahrain and Qatif. Also present were the *Huwalah*, Arabs who came from the Persian littoral, and Persians themselves. Africans had only been present in a limited number, mainly as domestic servants; however their number grew rapidly in the two last decades of the 18th century as the demand for more manpower in the pearl fishing industry increased (Ricks 1987). These groups have left little material in writing and only a sketch can be drawn.

What the Eastern Arabian coast did not have was direct interaction with Europeans. Visitors to the Gulf, so such Niebuhr, usually travelled along the Persian side of the Gulf, either by boat or overland. The East India companies likewise favoured the Persian littoral or Basra. No EIC factories, residencies or political agents were present until the 19th century, with a native EIC agent appearing only 1816 (Onley 2007:63). English intelligence officers only started reporting from the area after the destruction of Al Zubarah, see for example Taylor (1818) and Warden (1819), both in Hughes Thomas (1985). No proper map existed until Brucks' survey with the Bombay marine in the 1820s. The European sources are therefore often based on hearsay of informants, informants that was not always local, and using these sources is methodologically challenging (Valenti 2011).

Also, owing to the nature of the presently available data, the discussions clearly favour economic history. Although this might present a one-sided historical view commercial activity did shape a large part of the history of the region and is intimately intertwined with the fluctuating fortunes of Al Zubarah. Understanding the nature of economic relations will therefore also informs us on the political and social nature of the region.

Research into the local and regional history of Eastern Arabia and the Persian Gulf in the later half on the 18th century suffers from a paucity of primary sources. The difficulty in accesses some of these is a further hindrance. As few events are covered or confirmed by other contemporary records, judging the validity of the sources is difficult.

Overall, there are at present only a few in-depth studies of the complex social and economic dynamics that facilitated the regional development and trans-regional trade in the 18th and early 19th century, Fattah (1997), Abdullah (2001) and Onley (2007) as noticeable exceptions. Even the most recent and thorough publication on pearling in the Persian Gulf only utilized primarily IOR material much the author's own regret (Carter 2012). As a result there is a limited and uneven but nonetheless complex body of sources for the history of Al Zubarah and the Persian Gulf in the second half of the 18th century.

7.9 FUTURE WORK

An international workshop held in collaboration with Qatar University is planned for late 2013. The present ambition of this workshop is to further identify relevant textual material, in Arabic, Persian, Turkish, Indian, Dutch, Portuguese and English, and an assessment of the appropriate methodological approach to these.

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APPENDICES

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An examination of the impact of
environmental disparity on the
occupation of Qatar

Phillip G. Macumber

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An examination of the impact of the environmental disparity of Qatar on its occupation

Summary

Physically, Southern Qatar is markedly different from northern Qatar by dint of its thick sand sheets and dunes, which influence the nature of the rawdah and associated vegetation. Moreover, there is no surface water in Qatar and the only continuous source of potable water is from the groundwater system. Therefore, from an occupational viewpoint, a more significant comparison of northern and southern Qatar is hydrological, and stems from the crucial differences in the quality of groundwater, with good quality groundwater being present in the north and poorer quality groundwater in the south. This disparity in water quality is reflected in the nature of occupation across Qatar both today in the distribution of modern farms; and in the past, in the distribution of settlements and remnant structures. More permanent settlements occurred in the north, especially closer to the coast where the water table was within ready reach by hand-dug wells, while in the south occupation appears to be more in terms of nomadic visitations, probably during sporadic periods when ephemeral surface or groundwater became available in response to storms or favourable seasons. However, even where/when there was no potable water, wells with more saline groundwater enabled year-round visitations, since the water was suitable for camels. In this respect the camels may be seen as portable desalination plants, converting non-potable brackish/ saline water into milk.

The groundwater salinity differential across Qatar is reflected by the presence of early permanent settlements, stretching from the Abbasid Murwab on the western coast to beyond Fuwayrit on the north-eastern coast. This is not reciprocated in the south. Similarly, the large number of cairns and cairn-fields present in the north showing human presence since Neolithic times are not matched in the south. Instead, cairns and ubiquitous small round structures are more thinly scattered; perhaps the next most common architectural features are the small mosques, represented only by a qibla wall and mihrab, which are most commonly found in small lightly-treed depressions scattered across the landscape. This pattern of settlement or visitations, rather than permanency, remained constant over the period for

which occupation of Qatar occurred. The 7,000 year old Shagra site where a small fisherman's hut was excavated in the 1980s, fits into this pattern.

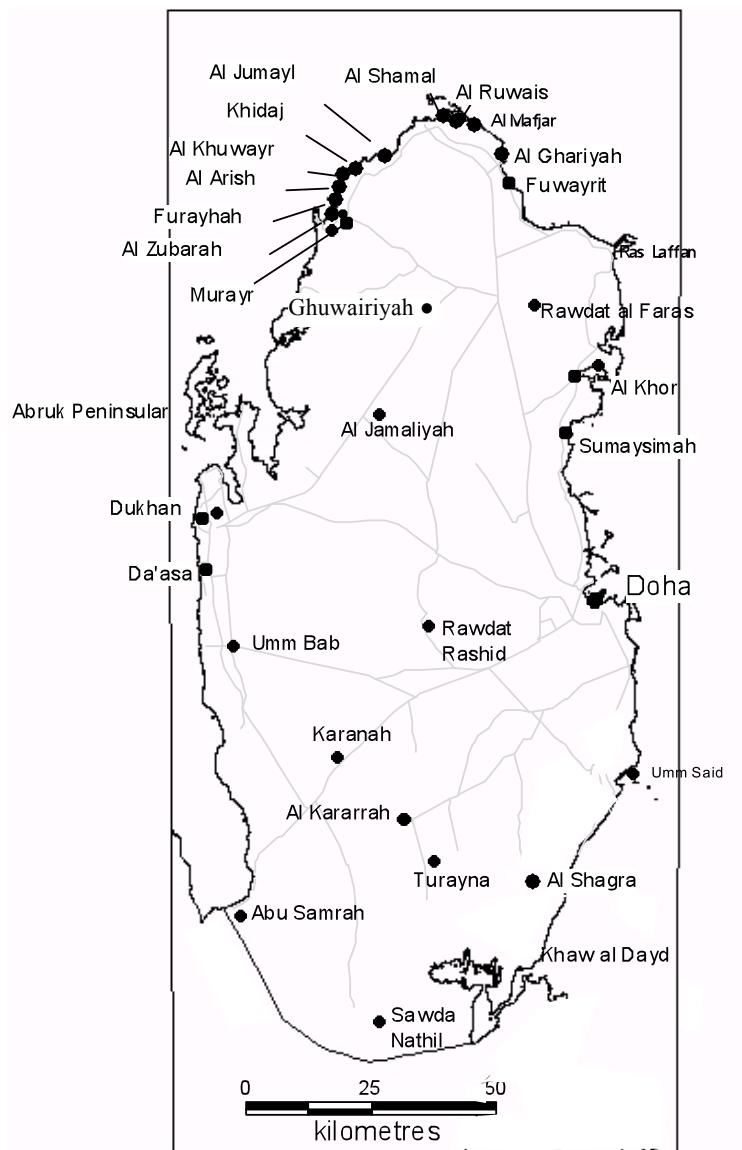


Figure 1 Locality map for selected towns across Qatar

1 Introduction - Potable water is the one essential requirement for settlement

Central to any holistic archaeological study is the relationship between occupation and the natural environment – why people live where they do. This is especially the case in Qatar where low rainfall coupled with low relief results in the absence of fresh surface water. The only natural water source is from groundwater occurring in the Tertiary marine limestone

aquifers, the Umm er-Rhaduma, the Rus, and closer to the coast the Dammam Formation which outcrops across much of Qatar. In the past, the distribution and availability of potable groundwater was a critical constraint to occupation across Qatar. Without a source of permanent fresh water, there can be no permanent settlement.

1.1 Qatar landscape and occupation

Qatar lies on a limestone peninsula extending northward from the mainland of Saudi Arabia into the Arabian Gulf along a north-south anticlinal structure referred to as the Qatar Arch (Figure 4). Tertiary sedimentation commenced in Palaeocene times with the marine limestone sequence of the Umm er Rhaduma Formation. It continued until the end of the Eocene with deposition of the Rus (lower Eocene) and Dammam Formations (upper Eocene) under marine to paralic conditions with the development of a limestone-evaporite sequence in the Rus Formation.

Almost all of Qatar has a relief of less than 100 m and an arid to hyper-arid climate with a highly variable annual rainfall, averaging 80 mm in the north and less in the south. Rainfall is extremely unpredictable and highly erratic across the country. Temperatures during summer are high ($> 40^{\circ}\text{C}$), and annual average evaporation rates of 2,200 mm, with very strong winds and high relative humidity (Abu Sukar et al, 2007). Evapotranspiration ranges from less than 2 mm/day in December to a maximum of 10 mm/day in June. Rainfall is mostly in winter, from winter westerlies, causing recharge into the Tertiary limestone aquifer system, especially following storm events. The low relief coupled with the high aridity results in no permanent surface water and occupation in the past was dependent on groundwater, accessible by hand-dug wells. Even where water was readily accessible, water quality was crucial. In more recent times, the use of modern drilling techniques has enabled water to be exploited from deep within the aquifer. Therefore a combination of groundwater depth and salinity determined the location and extent of settlement in Qatar up to the modern era of deeper drilled wells and desalination.

An indication of the distribution of usable groundwater may be had from examining the distribution of the main farming areas across Qatar in 1980 (Figure 2), which shows that the bulk of the farms lie in the north. Since water availability is central to permanent settlement, this is deemed to also more generally reflect the relative habitability across Qatar. One rider is that the farm well plots do not take into account the numerous hand-dug wells which pre-date modern (post 1950s) farming. This is especially the case in the coastal areas of northern

Qatar between Fuwayrit and Al Zubarah (Figure 1), and, along the north western coast line, a zone of shallow wells (Figure 3) is distinguished by Lloyd et al., (1981).

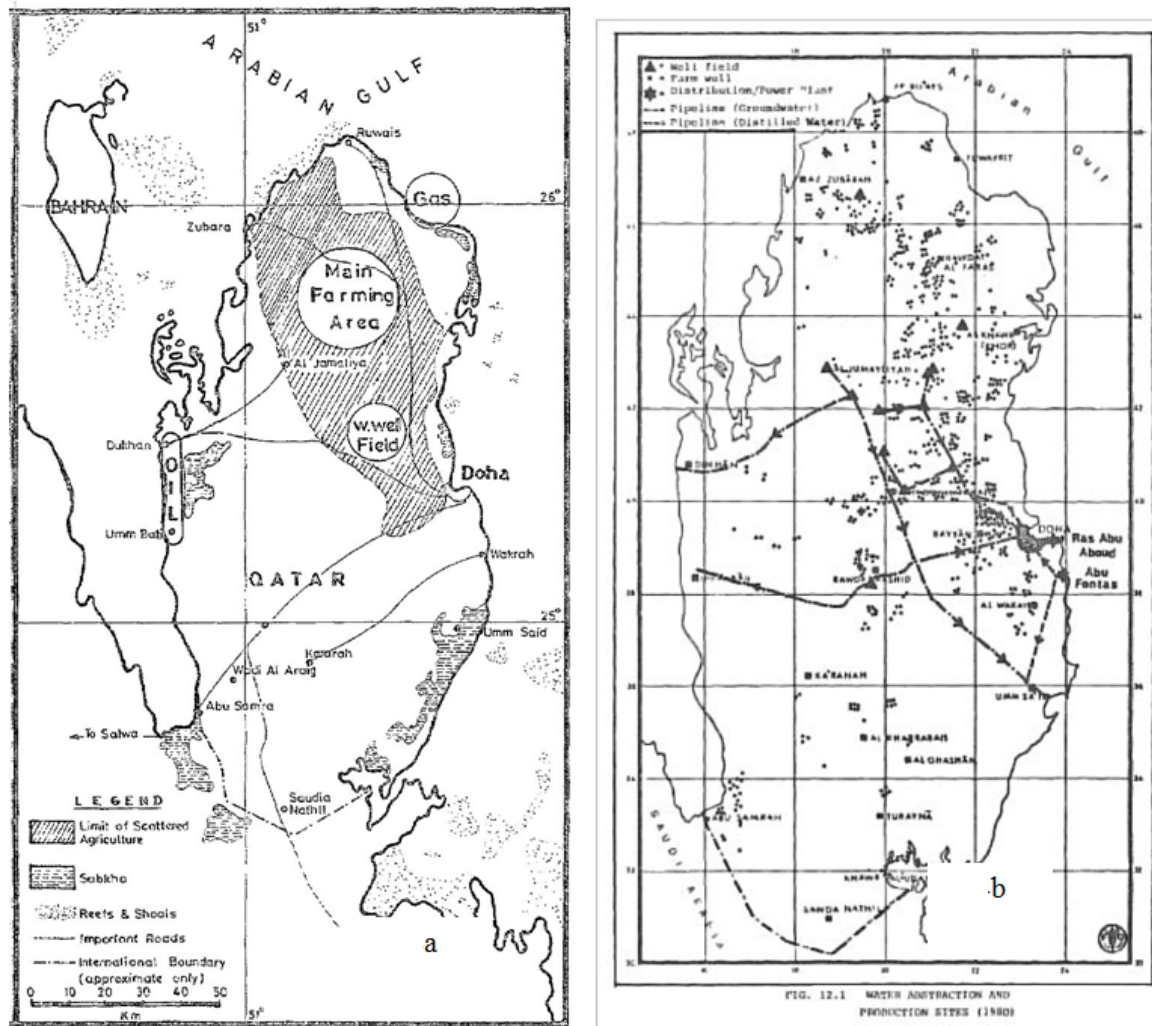


Figure 2 Distribution of agriculture (from Dastane and Al-Faihani, 1980) and bore localities (Eccleston et al., 1981)

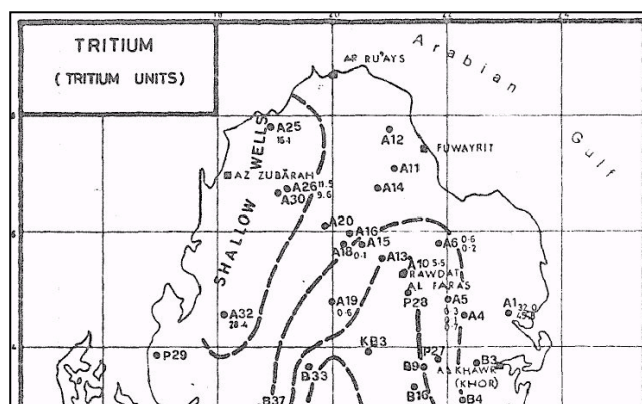


Figure 3 Northern Qatar with the zone of shallow wells and tritium content of groundwater (from Lloyd et al., 1981)

As occurs throughout much of the Gulf region, the major aquifers are located in lower to mid Tertiary marine sequences. These are principally the Umm er Rhaduma limestone and the overlying Rus limestone and anhydrites. The Dammam Formation forms the surface across much of Qatar (Figure 4).

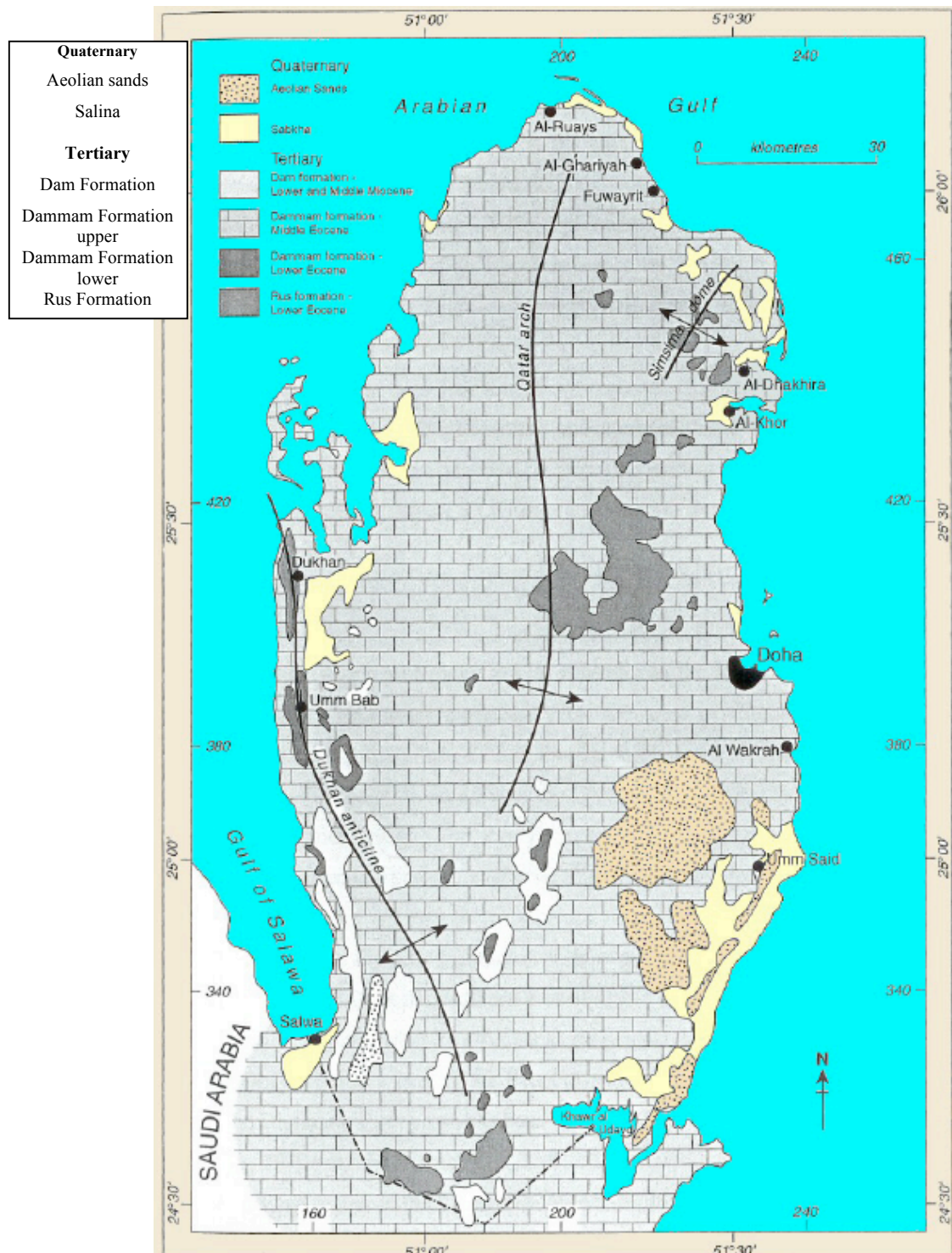


Figure 4 Simplified geological map of Qatar modified after UNDP (1978) and Al-Yousef (2003) – from Le Blanc, 2008

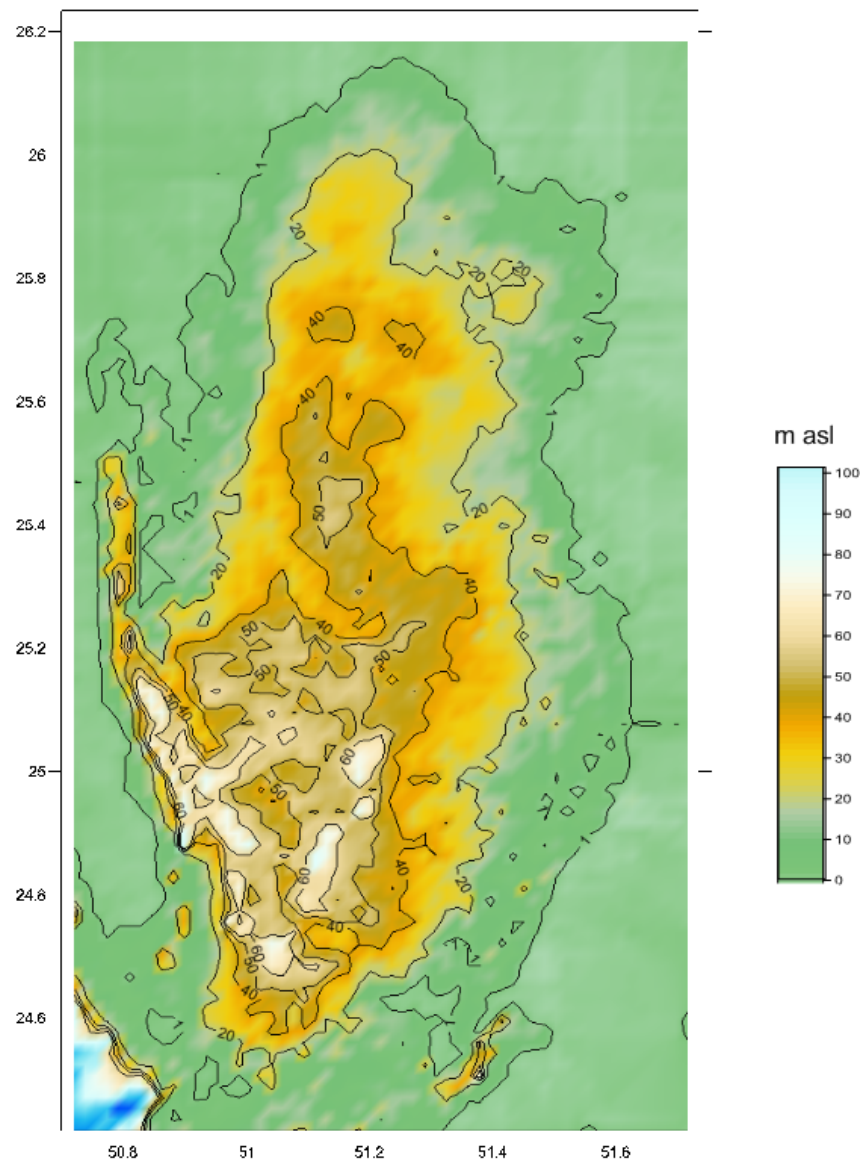


Figure 5 Topographic map of Qatar

In practice, given that inland recharge and coastal discharge occur via the Dammam Formation, the Rus and Dammam sequences are lumped together as a single aquifer. This is aided by the significant absence of lower Dammam shales in the centre of the peninsula.

Permeability in the aquifers is mostly secondary and induced by extensive dissolution, especially of the Rus Formation, which occurred during wetter periods in the Quaternary. This has in turn led to widespread collapse, creating cavities and fractures in the limestone and rawdah at the surface. These features provide a mechanism for recharge.

1.2 Northern Qatar physical environment

In the north of Qatar, the rawdah are small basins of internal drainage with localized catchments, ranging in area from 0.25 to 45 km², but catchment boundaries may sometimes be imperceptible with flat interfluvies creating a subdued landscape. Colluvial soils made up of calcareous loam, sandy loam and sandy clay loam have accumulated in the rawdah to depths ranging from 30 to 150 cm, overlying limestone fragments and bedrock. At times, intricate meandrine erosional patterns ('playettes', Macumber 1968; 2011b) appear on the floors in the deeper parts of the depressions, which are often treed, and reflect the presence of shallow groundwater. The rawdah depressions which collect surface water from direct rainfall and from runoff from surrounding bedrock areas, are the main source of recharge into the aquifer system.

The development of groundwater mounds beneath depressions, both seasonally and intermittently after discrete storm events (Figure 6), was described by Eccleston et al., 1981, who established piezometers in depressions at Musaykah and Rawdat Al Faras, where water tables were between 8 and 8.5 m below the surface (Figure 6).

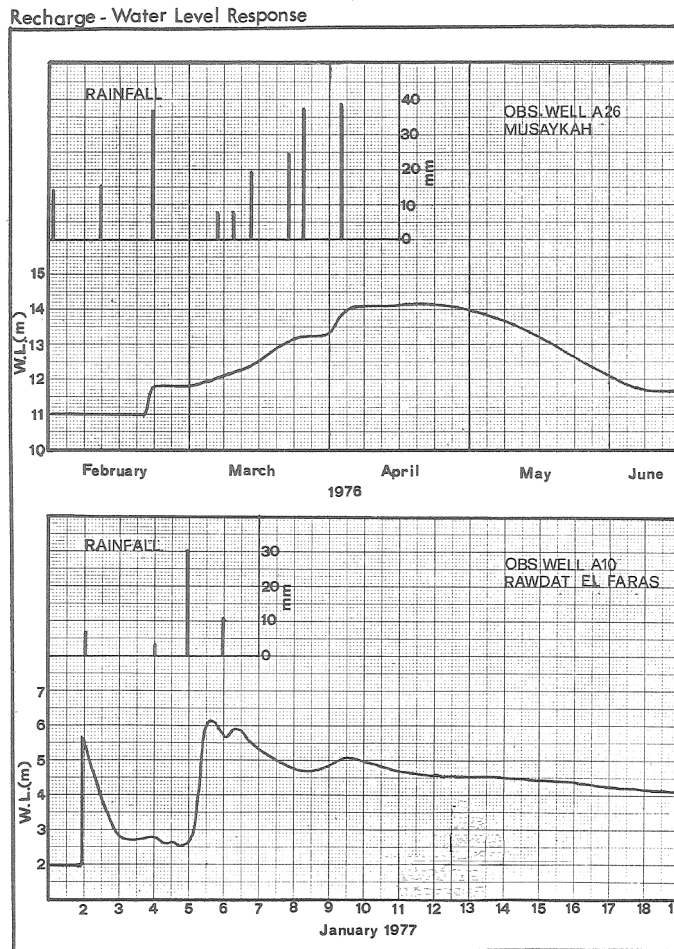


Fig 10.9

Figure 6 Response of groundwater levels to rainfall in pre-development localities (Eccleston et al, 1981)

Measurements made over the winter and spring periods in 1976 and 1977 show the development of recharge mounds developing both seasonally over spring, and after discrete storms (rainfall shown in the inserts at the top of graphs). The levels shown in Figure 6 represent water table height above sea level, showing more general rises of 3-4 m, and 3-4m after single events in the case of Rawdat Al Faras, which had only partially declined two weeks later. Superimposition of discrete rainfall events during wetter seasons may create significant temporal mounds beneath the rawdah. Such rises are capable of producing groundwater outcrop (surface water) wherever water tables are initially close to the surface. This may occur even with deeper groundwater tables in response to superimposed or prolonged rainfall events. It is considered that similar rises play a part in the development of the playette patterns seen across northern Qatar, with channels formed by water out-seeping from the sides of depressions (Figure 8). The presence of water at the surface in such instances is therefore not simply a ponding effect of rainfall and runoff, but is also a reflection of the rapid response of the water table to wet events. The rate of decline of the

underlying groundwater levels then determines the period for which water remains visible at the surface.

Shallow hand-dug wells are commonly found associated with the rawdah, which form a focus for the numerous farms that were established in recent times.



Figure 7 Well in grassed rawdah at Umm al Qubur



Figure 8 Typical channelled 'playette' drainage pattern (foreground) formed on the lower-most parts of the rawdah floor, where the channels are commonly associated with trees – al-Sidriyah



Figure 9 Flooding of the rawdah in the vicinity of Umm al-Qubur (photos courtesy of Dr Tobias Richter)



Figure 10 Infilled well in small rawdah, west of Mafjar



Figure 11 Infilled well in the Muharaqit irrigation area, near Halwen



Figure 11a. Traditional irrigation area near Umm Jassim. Note the high well density relative to the fields, most clearly seen in the bottom right hand quadrant and further north as trees commonly associated with wells

1.3 Occupation in southern Qatar

1.3.1 Physical Environment

In southern, central and western Qatar, the landscape is dominated by low Neogene hills and extensive limestone peneplains across which there are large areas of barchan sand dunes. The deeply eroded central plateau reaches a height of 103m, however the bulk of the plateau lies between 40 m and 60 m (Figure 5). Across the region the landscape is subject to intense sandblasting during the frequent sandstorms, which has resulted in scalloped and fluted limestone bedrock (Figure 17) and also the Pleistocene limestone strandlines (Figure 16).

While rawdah-like depressions occur in the south, they are fewer, and are small and isolated, with sandy floors and scattered vegetation. There are also a limited number of large depressions such as those near Turayna and Karana, with the floor sometimes as much as 20 meters below the general plain surface, which may form a distinct rim. The floor of the large depressions range from rocky to flat with low points variously covered by vegetated aeolian sands.

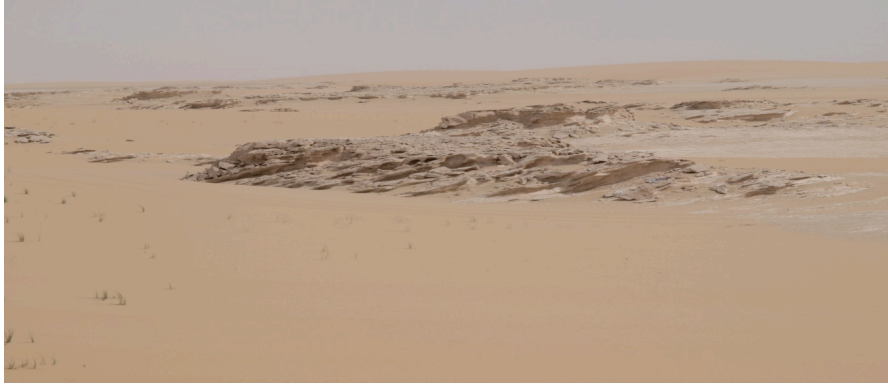


Figure 12 Sand and rock landscape in south-eastern Qatar



Figure 13 Erosion remnants of Neogene sediments with sand accretion



Figure 14 Semi-treed base of a depression with a sandy floor, during sand storm



Figure 15 Triangulation point G08, established on a remnant of Pleistocene strand line.

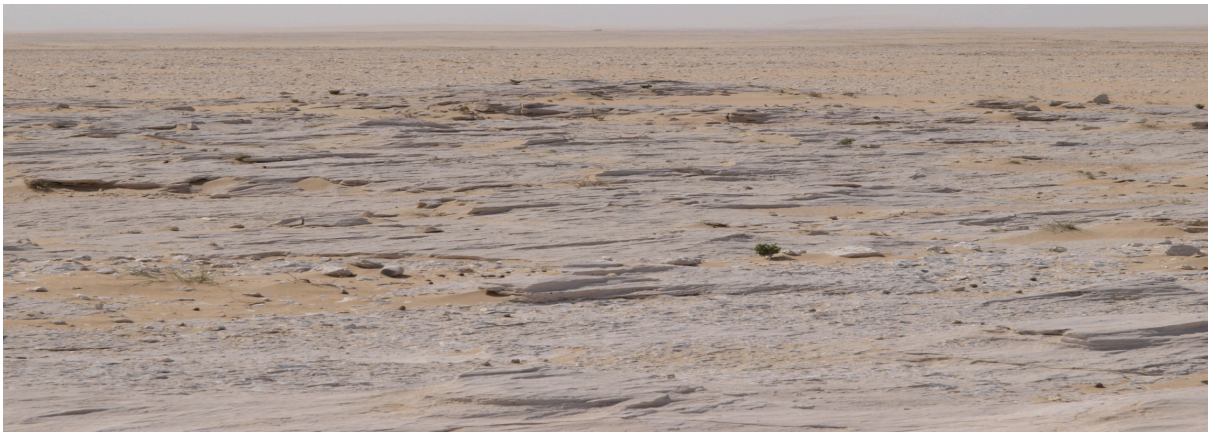


Figure 16 Wind/sand fluted aeolian limestone surface

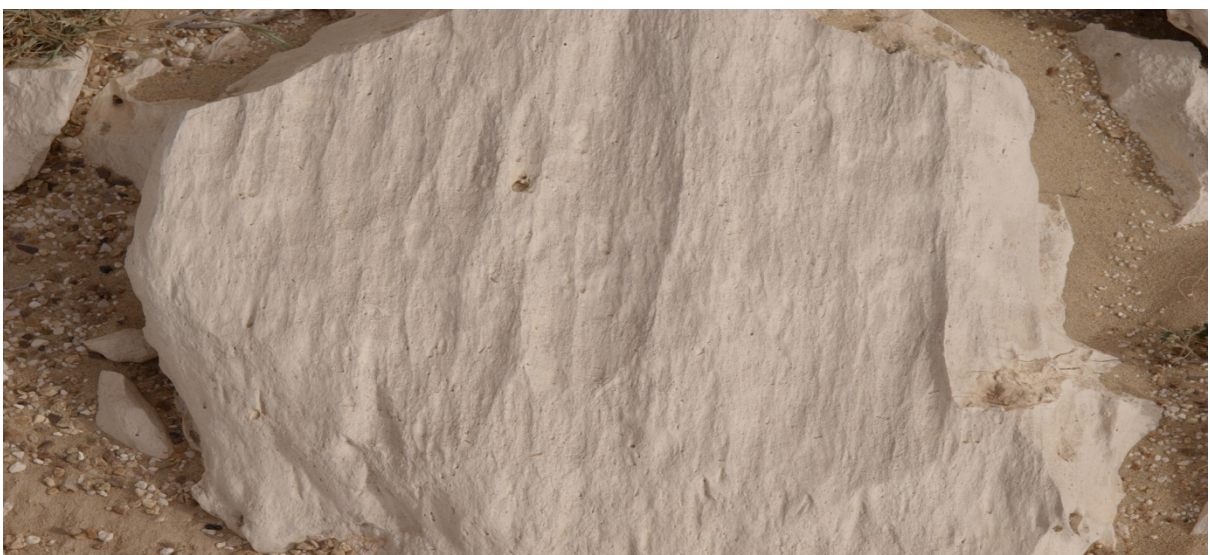


Figure 17 Wind and sand striated Dammam Formation limestone

1.4 Groundwater and occupation

1.4.1 Impact of geology on groundwater quality across Qatar

The Qatar peninsula was formed by uplift along a N-S structure called the Qatar Arch (Figure 5). In northern Qatar, deposition of the Umm er Rhaduma and Rus Formations was strongly influenced by the Qatar Arch, resulting in two distinct facies – a calcareous facies straddling the structure and a gypseous facies on the flanks lateral to calcareous facies (Figure 18).

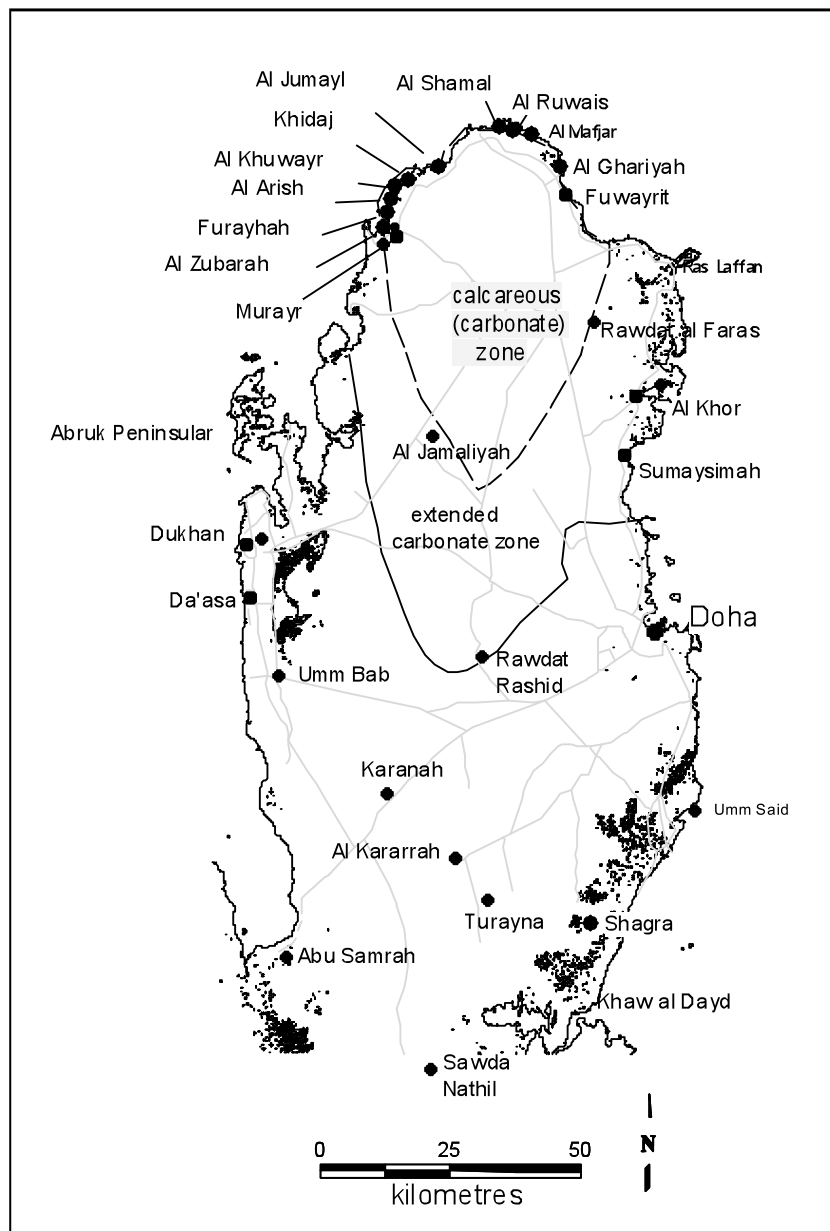


Figure 18 Relationship between the freshwater carbonate zone and town distribution across northern Qatar

While the different depositional environments have led to the two major facies, this distinction has been modified by post depositional anhydrite (Ca SO_4) dissolution, causing the original carbonate-gypsum facies boundary to migrate southwards, where it is now seen as a "V" or fan shaped boundary with its apex in the vicinity of Rawdat Rashid in central Qatar. To the north, the Rus Formation is a predominantly carbonate facies with only residual deposits of inter-bedded gypsum. To the south, the Rus Formation is mostly gypseous (Figure 18 and Figure 19). The calcareous facies is largely absent from southern Qatar, although a narrow band occurs in the west, associated with the northwards trending Dukhan anticline passing southwards through Umm Bab towards Turayna (Figure 19). Because of the strong effect of the gypseous sediments on reducing groundwater water quality, Qatar is divided into two separate hydrogeological provinces: one in the north and the other in the south (Figure 19).

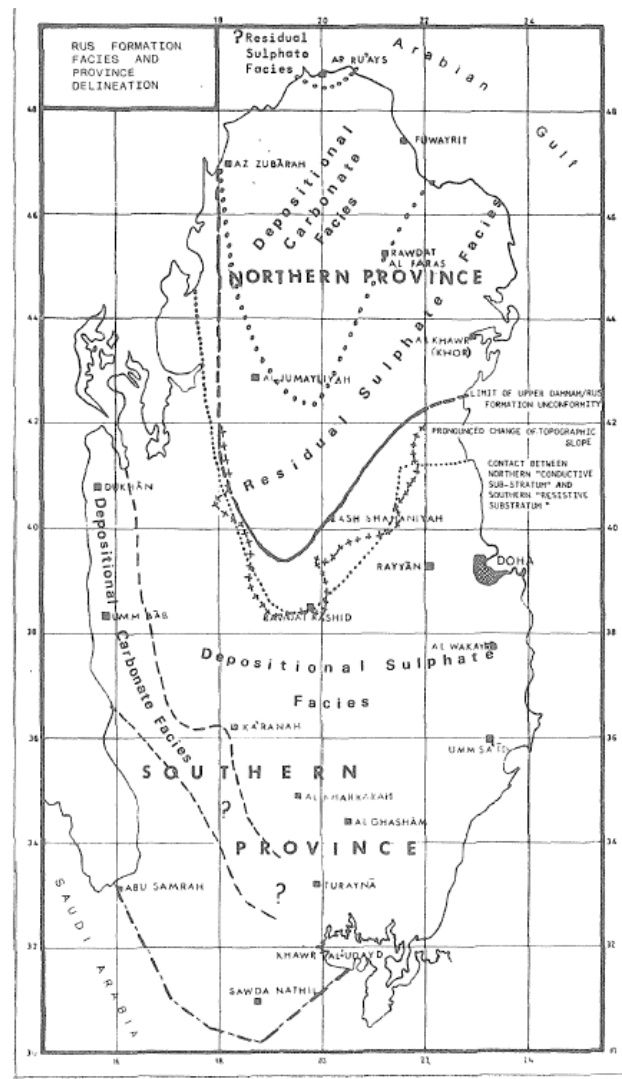


Figure 19 Litho-facies in the Rus Formation and hydrogeological provinces (Eccleston et al, 1981)

The distribution of farm pumping wells (hand dug and drilled) in Qatar within the extended carbonate line (Figure 20) clearly shows the fresher water distribution and hence the influence of the carbonate facies on groundwater quality across Qatar. There is a very low density of farm wells in southern Qatar compared with that in the north, and this difference echoes the asymmetric distribution of occupation of Qatar in the past, and hence gives an insight into its archaeology. The extended carbonate line is also shown in Figure 20.

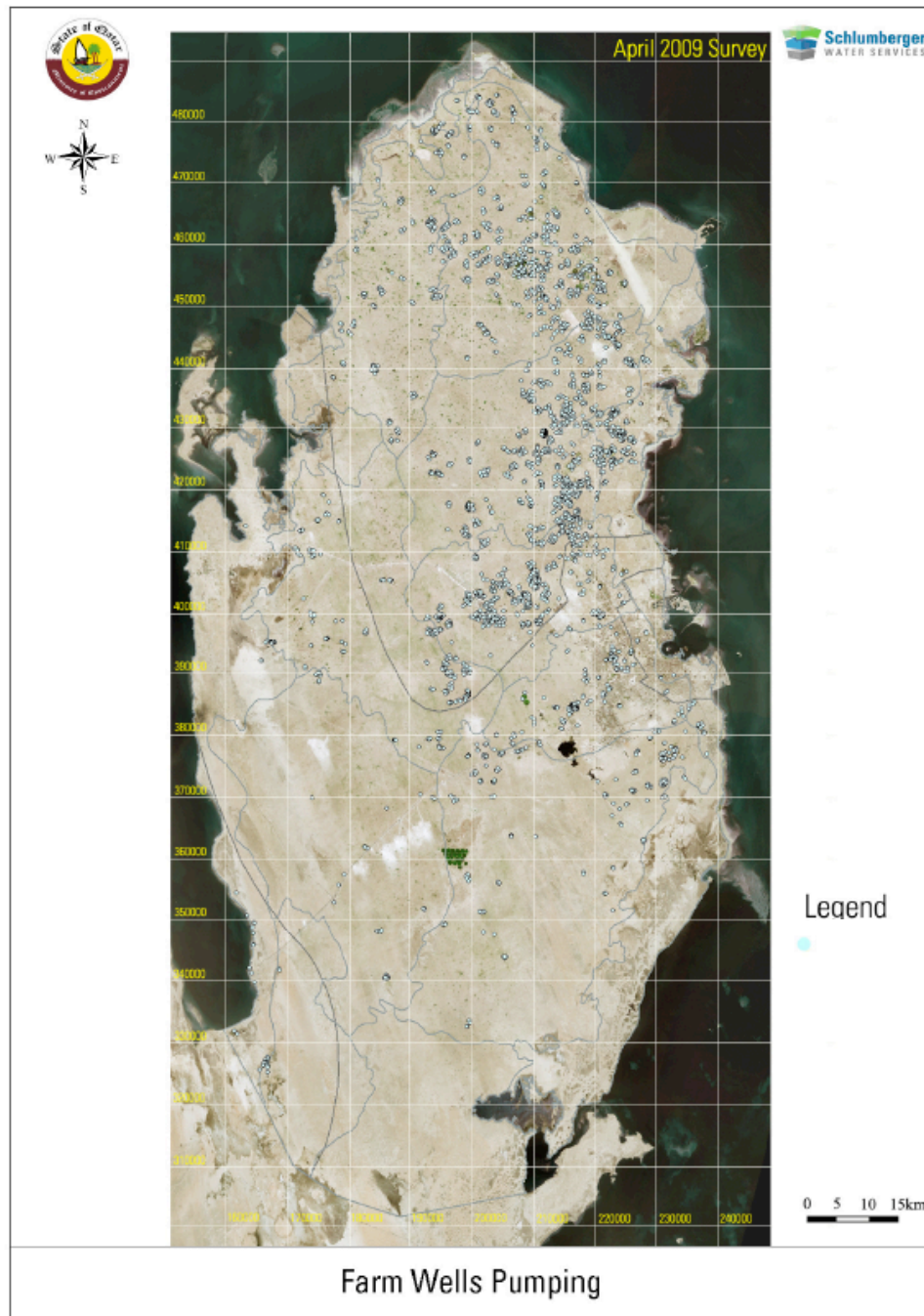


Figure 20 Distribution of farm pumping wells across Qatar (Dept of Environment 2011)

1.4.2 Presence of a freshwater lens in the north

Despite very low rainfall, localized recharge via the rawdah has resulted in the development of a complex fresh groundwater lens within the calcareous facies of the aquifers across northern and central Qatar (Figure 21). The fresh water overlies more saline regional groundwater deeper in the Umm er Rhaduma aquifer. Elsewhere in Qatar to the south of the calcareous zone, the aquifer system is mostly gypsiferous and the groundwater is normally brackish to saline (Figure 31).

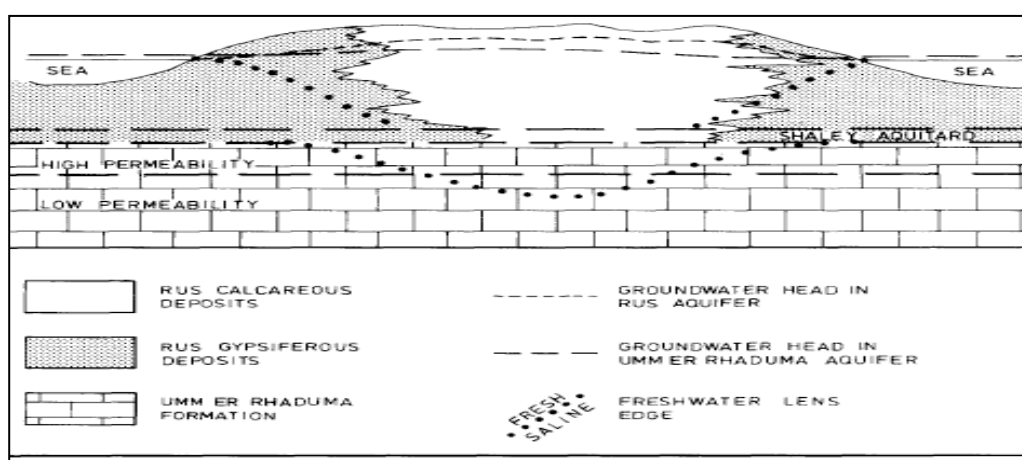


Figure 21 Schematic cross- section across northern Qatar of the aquifers and the freshwater lens (from Lloyd et al, 1987)

Groundwater recharges in the hinterland and flows coastward where it discharges into the saline sabkha system. On approaching the coast the depth to the water table shallows, as does the depth to which hand-dug wells were required to go. Settlements were therefore concentrated closer to the coast, and those directly on the coast like Al Zubarah and Fuwayrit, where intruded seawater precluded a direct water source, received their water from nearby inland settlements such as Murayr and Athbar respectively. In a broader sense, the influence of water table depth and salinity in determining the distribution of archaeological sites across Qatar is clearly seen in the case of the early Islamic linear sites found between Al Athbar in the east and Al Haddayah in the west. All were associated with nearby rawdah with ready access to shallow potable groundwater. By contrast, permanent occupation in southern Qatar where the water was largely brackish to saline is sparse, with relatively few modern day or ancient settlements.

Therefore, while groundwater salinity plays the most crucial role in the distribution of early settlement, the depth to the water table is also influential, even where the groundwater was fresh. Since depth to the water table determined the availability of potable groundwater in the past, an understanding of the pre-development groundwater levels (potentiometric surface) provides some understanding of where potable groundwater was accessible by hand-dug wells, and hence where settlements might have occurred, or conversely, where they couldn't have occurred. The pre-development levels are notably different from the present groundwater levels given the intense degree of groundwater exploitation that has occurred over the last 50 years. The following section establishes the approximate depth to groundwater under Qatar prior to the recent phase of groundwater development since the 1950s.

1.4.3 Pre-development groundwater Levels and hand dug wells

The water table has fallen markedly in response to the development of the groundwater systems over the past 50 years. Given that in pre-development times there was a practical depth limitation to which hand-dug wells might go in order to intersect the top of the freshwater lens, the pre-development depth of the water table provides a gauge to the areal distribution limits for which permanent settlement was likely to be found. In practice, it implies that since the water table is relatively flat, settlements were far more likely to be found in the lowlands and unlikely to be present in the higher areas of Qatar (Macumber 2009). Measurements of the potentiometric surface (groundwater level relative to sea level) were first undertaken in 1958 by Le Grand Adsco and later again in 1979. The 1958 surface was assumed by workers to represent the steady-state equilibrium condition which existed prior to the onset of the modern development. It therefore represents the base condition of the water table in the period prior to 1958, at a time when aquifer recharge in the hinterland was balanced by outflow at the coast. It is therefore the closest understanding that can be had to the pre-modern groundwater levels that existed from 6000 years BP (following the end of previously wetter conditions of the early Holocene) up to the 1950s. Prior to the late 1950, agriculture in Qatar was confined to a few farms and date gardens within the environs of Doha and some of the other main centres of the country, but from about 1958 onward the number of farms increased steadily to reach a total of over 350 by 1967 and was in excess of 500 by 1980. This is also shown by the rise in groundwater pumped between 1950 and 1972 and between 1975 and 2010. (Figure 22 and Figure 23). During this period there was a

significant fall in groundwater levels across Qatar. The decline starts just prior to 1958, and the groundwater levels of 1958 are taken as representing the pre-development situation across Qatar. It provides an approximate depth to water tables for which hand-dug wells were required to go. Amer et al (2008) show a five-fold increase in groundwater extractions since 1975.

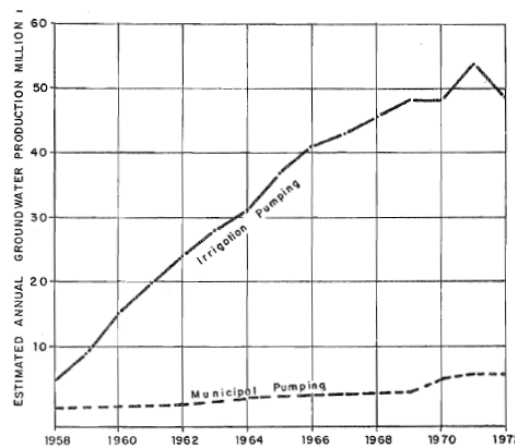


Figure 22 Estimated rise in groundwater production across Qatar from 1958 to 1972 (FAO, 1974)

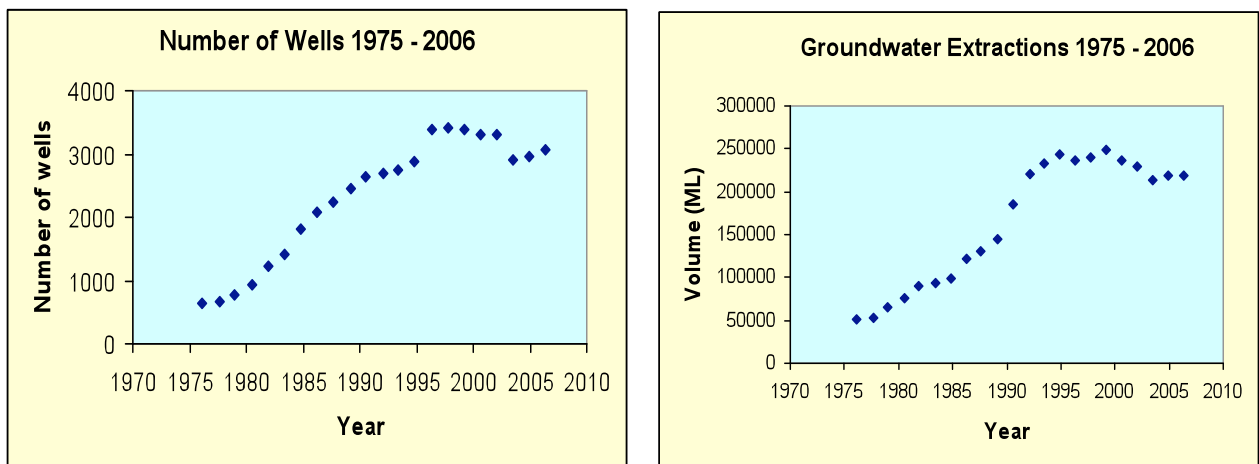


Figure 23 The number of wells and the amount of groundwater extracted from 1975-2006 (data from Amer et al, 2008)

An approximation of the pre-development water table depth across all of Qatar may be obtained by taking the 1972 potentiometric surface (Figure 24) for all of Qatar and adding the amount that the water table fell between 1958 and 1972 (Figure 25), using the potentiometric head and decline figures provided in FAO (1974). The 1972 potentiometric surface shows two small (ca 4 m high) groundwater mounds - one in the north and one in the south.

Adjacent to the coast, groundwater levels were generally less than 1 m above sea level in 1974. Groundwater development began in approximately 1958, and the subsequent decline in levels by 1972 is shown. However, it is notable that this decline extended only across north and central Qatar, reflecting the insignificant pumping in the south due to the lack of bores. The 1972 (Figure 24) and 1958 (Figure 26) groundwater levels are overlaid on the coloured topographic map (legend shown).

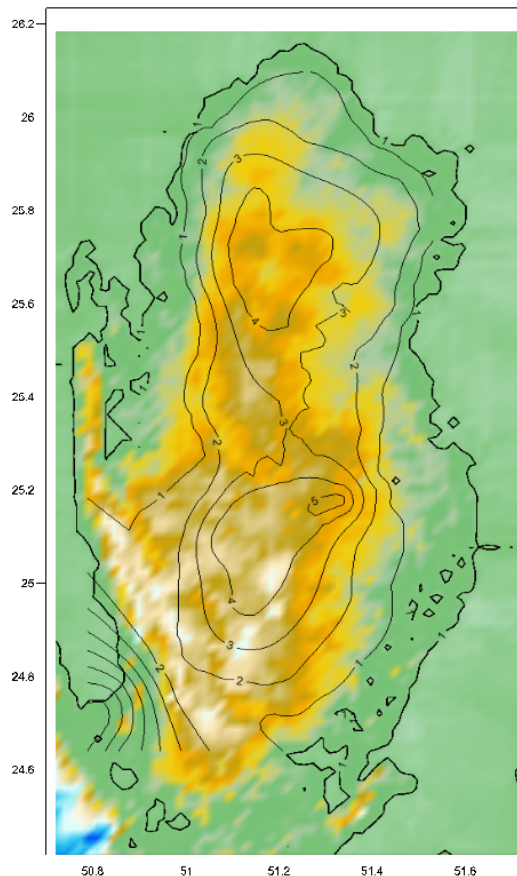


Figure 24 Potentiometric surface 1972 (amsl)

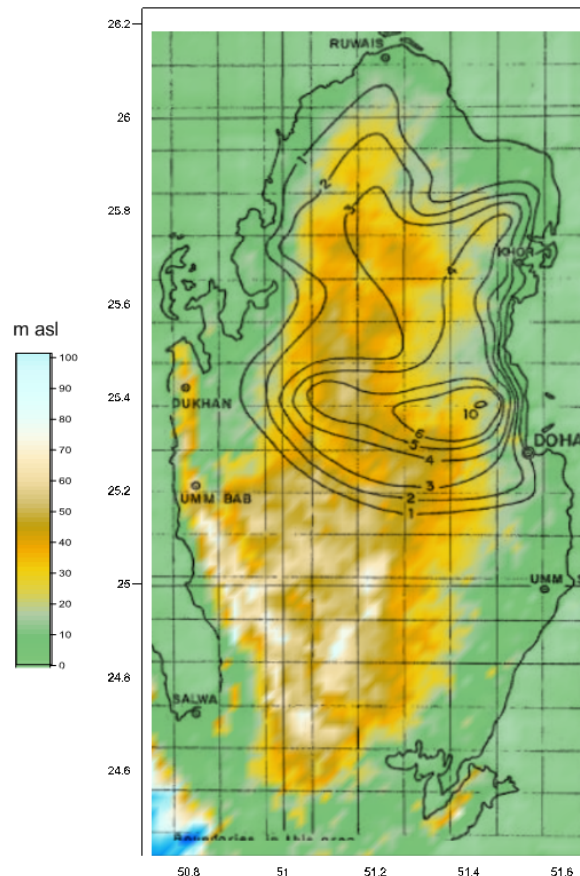


Figure 25 Groundwater level decline 1958 to 1972 (m)

The pre-development 1958 groundwater levels may be obtained from adding the decline between 1958 and 1972 to the levels at 1972. This is seen in Figure 26 where the groundwater levels are shown as metres above sea level in 1958. This shows that beneath the higher areas of Qatar, groundwater levels were mostly greater than 25 m below the surface and therefore beyond reach by hand-dug wells

A further depiction of a 1958 potentiometric surface for northern Qatar alone comes from Eccleston et al (1981), based on Le Grand 1959. This is roughly similar to that calculated

using the earlier 1974 FAO data set but with the water table at 12 m above sea level (25 or more metres below groundsurface) in parts of central northern Qatar (Figure 27). All plots suggest that hand-dug wells were concentrated closer to the coast where the depth to the water table was relatively shallow. This is also clear from Figure 28, Figure 29 and Figure 30, which show the west-east water table profile using groundsurface sections across Qatar at Ghuwairiyah, Doha and Umm Said - based on the data given in FAO (1974) .

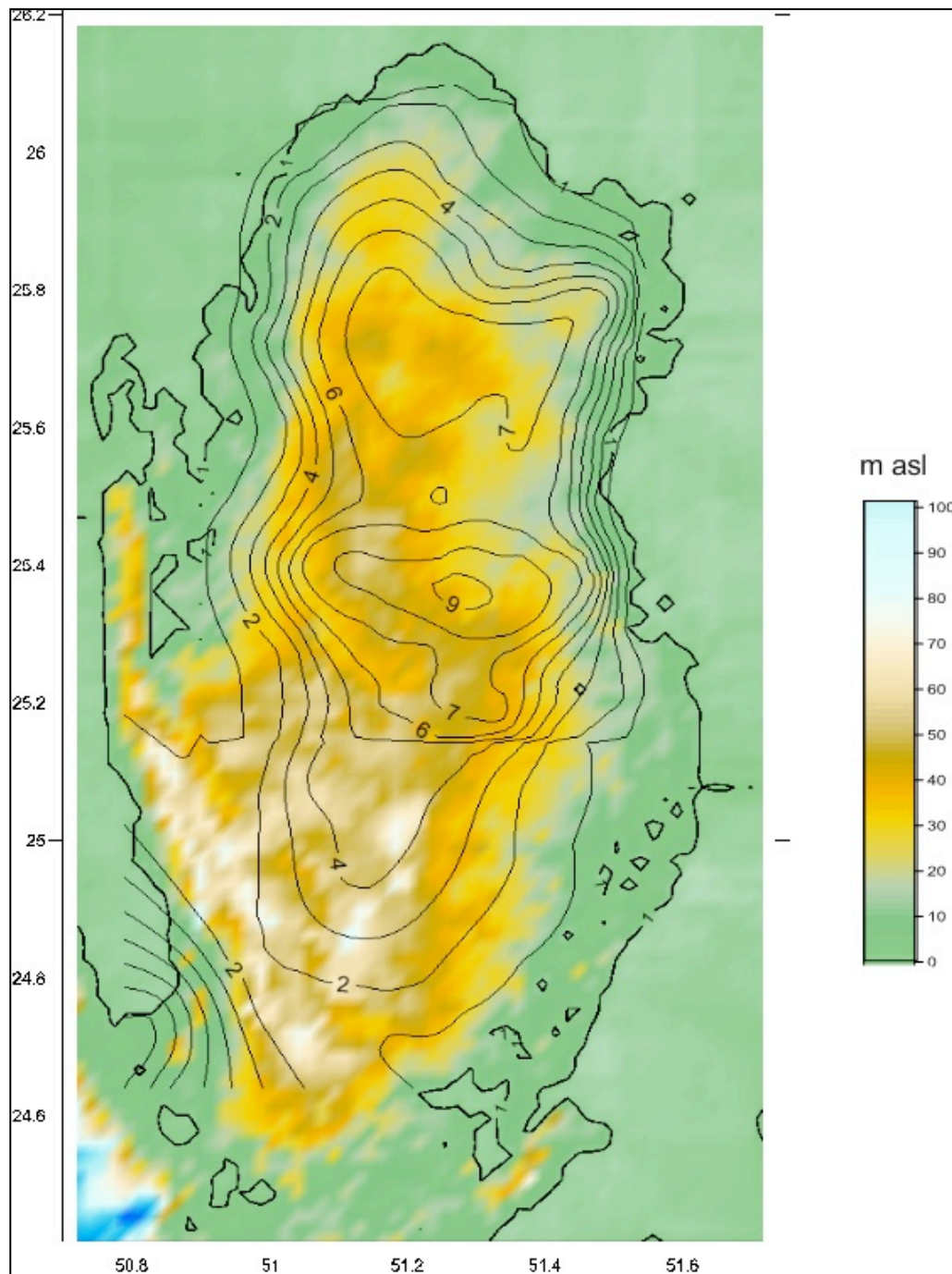


Figure 26 Potentiometric surface in 1958 obtained from 1972 FAO data

Three W-E coast to coast sections across Qatar show the potentiometric surface and hence the depth required to excavate a hand dug well to reach the water table - in the north through Ghuwairiyah (Figure 28 - locality Figure 1), in central Qatar through Doha (Figure 29), and in the south through Umm Said (Figure 30). In general, the depth to the water table increases markedly on passing southwards as the landscape elevation increases.

The depth to the water table is shallowest in near-coastal settings where the groundwater systems outflow, and are most readily tapped by shallow wells. This is the case with the towns around northern Qatar from Al Zubarah to Al Ghariyah, and readily seen at Al Zubarah where fresh water was obtained from a number of hand-dug wells located on the higher ground at Murayr. Further inland as the land surface rises, the depth to the water table concomitantly increases to a point where the groundwater was largely beyond practical reach by hand-dug wells. This was no longer was the case with to the introduction of modern drilling techniques.

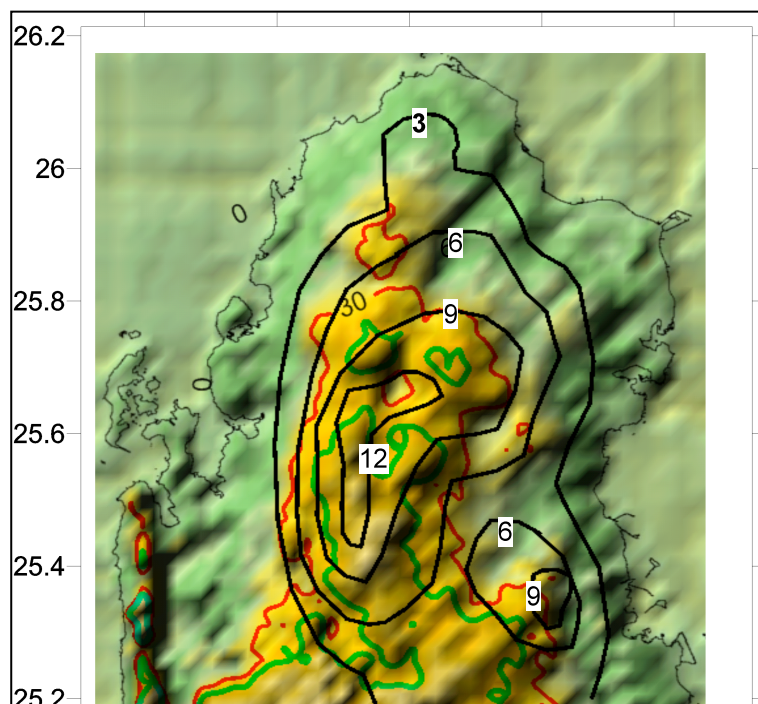


Figure 27 Potentiometric surface in 1958 (m asl) across northern Qatar (Eccleston et al., 1981) overlaid on topography emphasizing the 30 m (red) and the 40m (green) contour

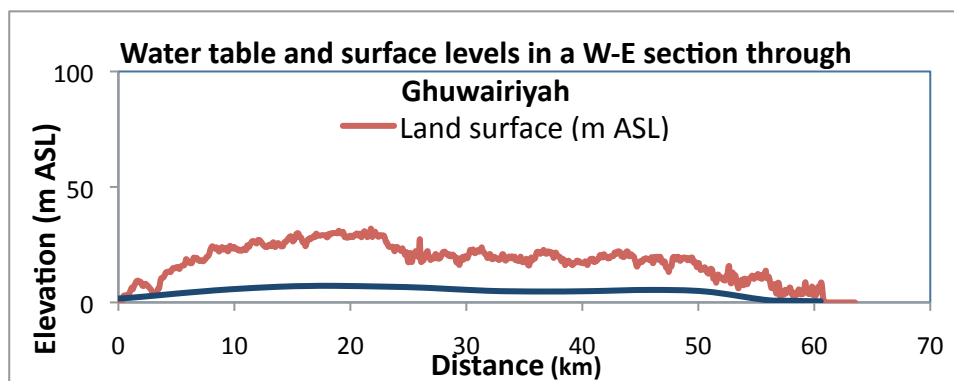


Figure 28 Water table (blue) and surface elevation in a section through Ghuwairiyah - 1958

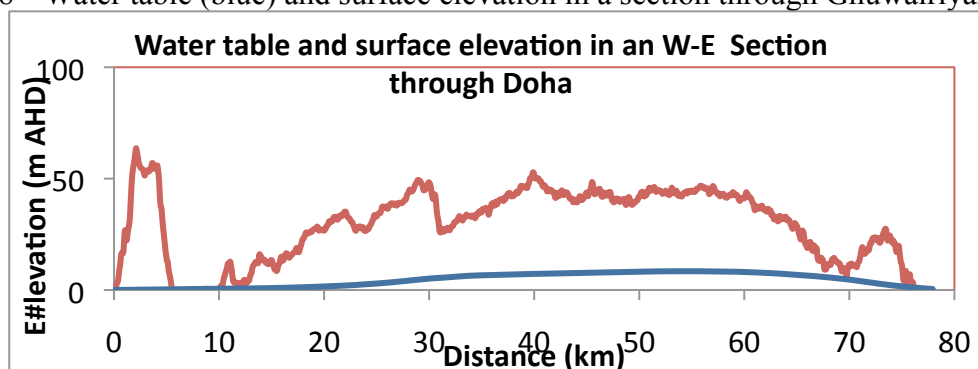


Figure 29 Water table and surface elevation in a west to east section through Doha - 1958

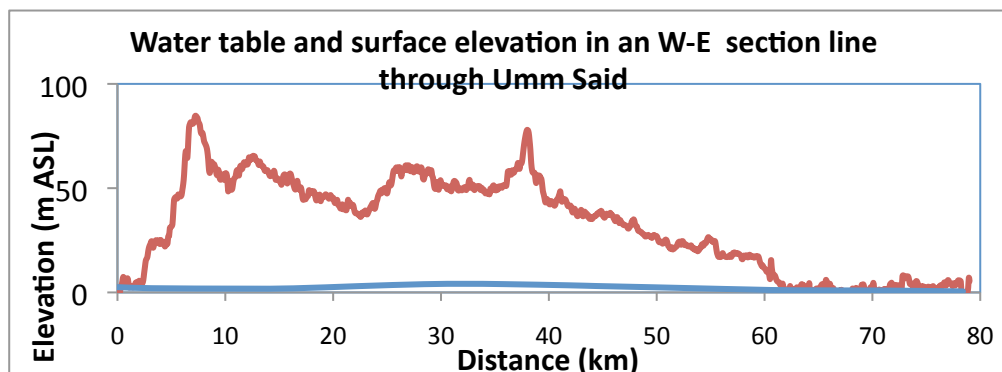


Figure 30 Water table and surface elevation in a west to east section through Umm Said - 1958

1.4.4 Groundwater salinity

Clearly, even where water is within reach by hand-dug wells, its potability is crucial if there is to be ongoing settlement. World Health Organization (WHO) requirements put the desirable upper limits for salinity as about 5-600 mg/l TDS. More generally, it is perceived that water over 1000 mg/l becomes unpalatable. However there are a great many areas where these levels are exceeded, and in such cases an extreme upper limit ranging of 1500-2,000 mg/L is varyingly set. This is the case for example in India where the Bureau of Indian

Standards (BIS) has set a limit of 2,000 mg/L. The Council of Medical Research (ICMR), which prescribes 500 mg/L as the desirable limit of TDS for drinking water, places the uppermost limit, in the absence of alternate sources, as 3,000 mg/L. WHO also comments that while water with a TDS level of less than 600 mg/L is generally considered to be good, drinking-water becomes significantly and increasingly unpalatable at TDS levels greater than about 1000 mg/L.

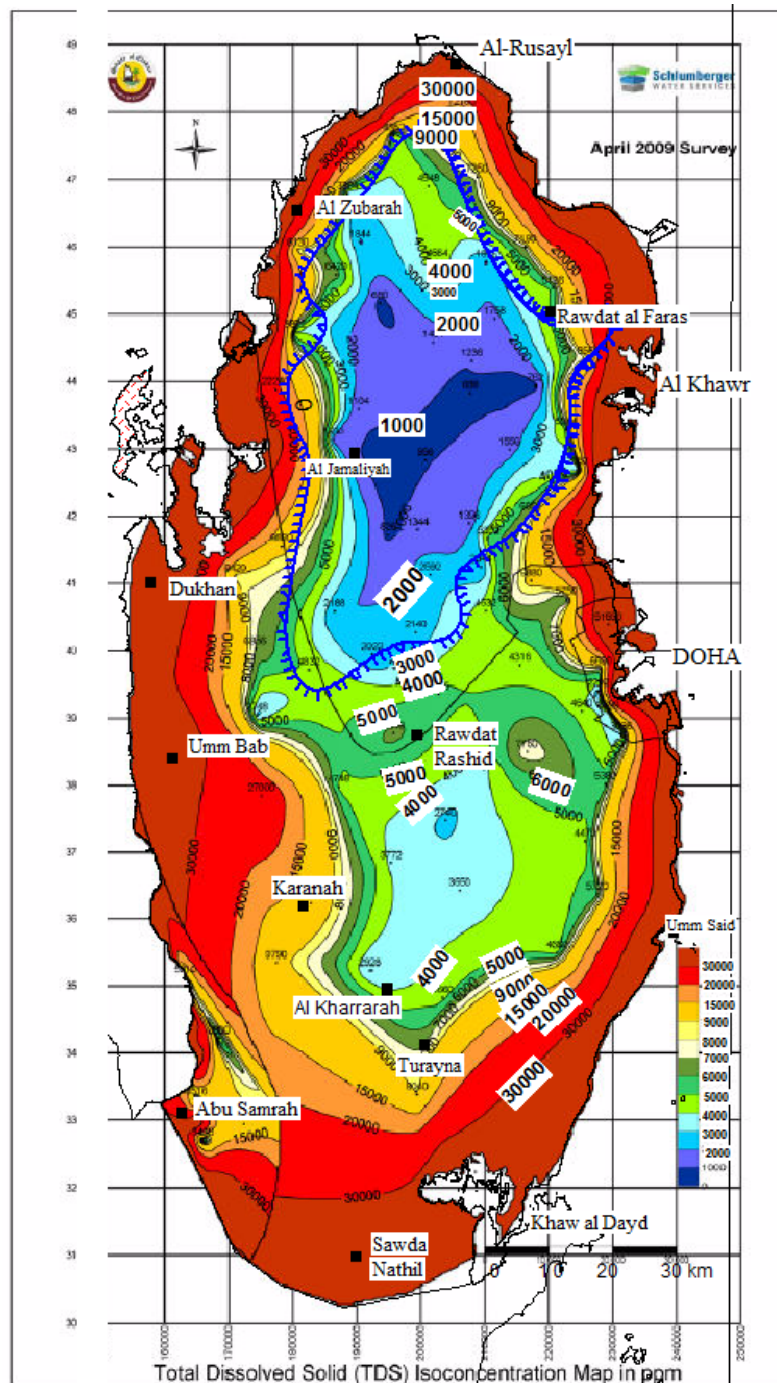


Figure 31 Salinity of Qatar groundwater in 2009 (TDS (ppm)).
(Dept of Environment, 2011)

Beneath the Qatar peninsula, potable groundwater occurs as a freshwater lens overlying saline water, which is recharged in the interior and discharges at the coast (Eccleston, Pike & Harhash 1981; Lloyd et al. 1987). The freshest groundwater occurs in the north and is associated with the carbonate facies of the Rus Formation. Groundwater flow is radial from the hinterland towards the coast, where between al-Zubārah and Fuwayrit in the north, it has supplied a number of settlements including those along the north-western coast at al-Zubārah (from Murayr), al-Furayhah, al-Jumayl, al-Arīsh, and Ayn Mahomed.

While temporary visitations may occur in response to seasonal rainfall, more permanent settlement in Qatar is dependent on groundwater and hence wells. Indeed, the history of Qatar may be deemed to be intimately interwoven with the history of its wells, the sites of which are commonly associated with a number of phases of occupation. A number of salinity maps of Qatar have been produced over the last 50 years, all showing the location of the centre of the freshwater lens in the north. The most recent was the 2009 survey prepared for the Department of Environment (Figure 31). On the map the 2000 ppm (~mg/L) salinity contour from the earlier survey undertaken for the 1974 FAO report is shown in blue with hachures, while the boundary between the carbonate and sulphate zones is shown as passing near Rawdat Rashid (Figure 31). An earlier map showing the groundwater salinity (referred to as 'irrigation salinity') was produced by Dastane and Al-Faihani 1980 (Figure 32). This map - while not as detailed as the 2009 map - more closely reflects the salinity patterns that existed prior to development.

The 2009 map shows clearly the disparity in groundwater salinity between north and south Qatar, delineated by the V-shaped line passing near Rawdat Rashid. Only a minute area to the immediate south of Rawdat Rashid is shown as having water within the 3000 mg/L category, while that with a salinity of 2000 mg/L or less all lies northwards of Doha. The V-shaped boundary stems from a southwards retreat of the former gypseous (anhydrite) zone within the Rus Formation following the leaching of Ca SO_4 , leaving a calcium carbonate enriched residual which does not contaminate the groundwater with gypsum, as occurs in the gypsum enriched facies. Groundwater salinity is lower in the leached zone than it is in the remnant gypseous zone.

The near coastal salinity shown in the salinity map is greater than 30,000 ppm (mg/L), which is consistent with sea water salinity of 35,000 mg/L TDS. While the freshest water is

shown as being well inland of the coast this is the result of two factors. Firstly, there has been a significant inland intrusion of the seawater wedge as a consequence of the depletion of the freshwater lens in the post-development era with the rate of sea water ingress into the aquifer has been recorded as being as high as 1 km/yr in the north (Macumber, 2009). Secondly, much of the data comes from drilled bores rather than hand-dug wells and the bores are generally deeper, passing through and being screened in saline intervals below the thin freshwater lens in near-coastal settings.

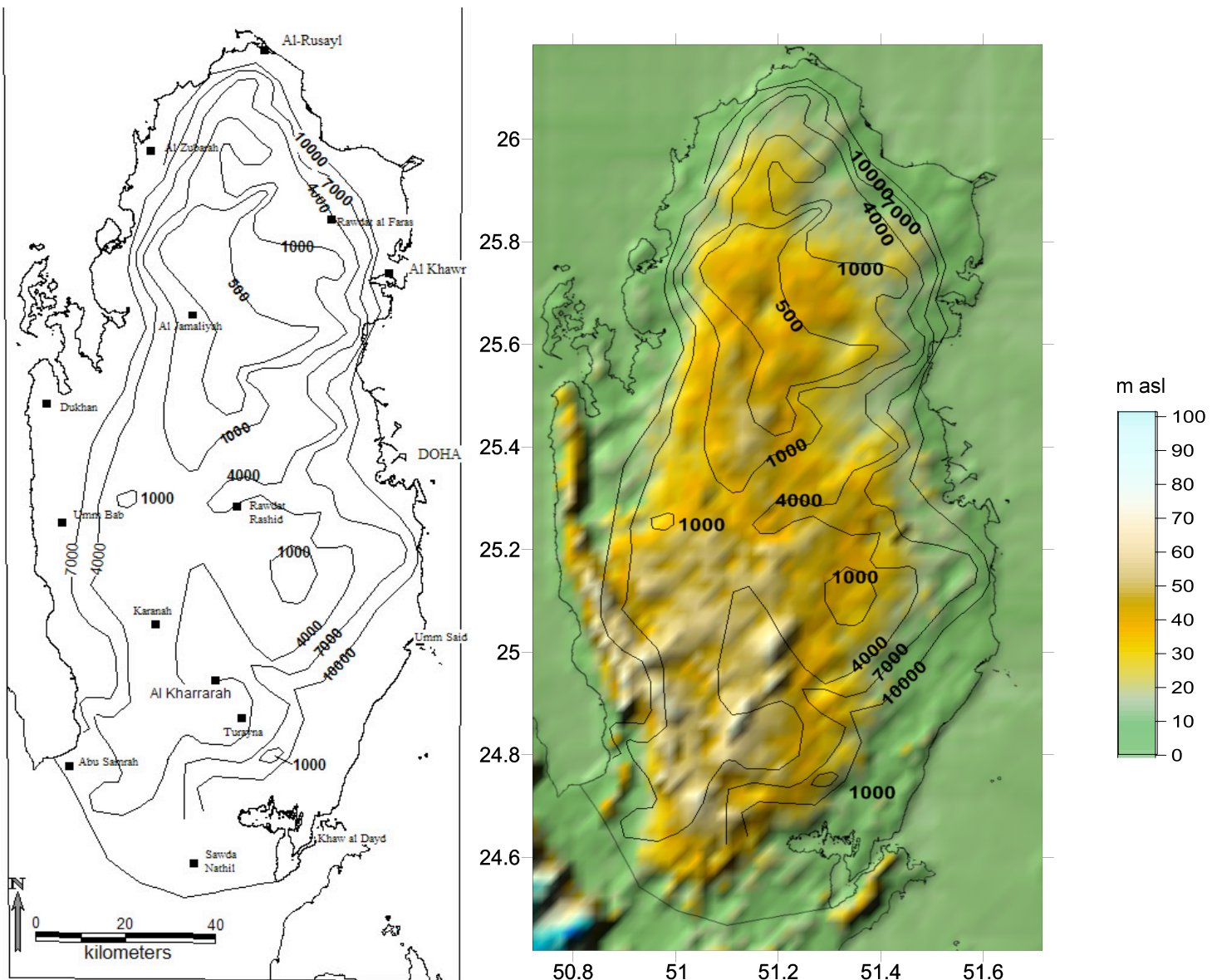


Figure 32 Qatar relief and groundwater salinity (based on data from Dastane and Al-Faihani, 1980)

The earlier coastal hand-dug wells, on the other hand, tapped the top of the freshwater lens, as was the case at Murayr, near Al Zubarah, skimming the uppermost fresh water for domestic use and in some cases for irrigation (Macumber, 2009; 2011).

The broad distribution of fresher water encompasses the area shown in the 1980 FAO Report as that where agriculture was mostly practiced. The borehole data supporting this is shown in Figure 2. Dastane and Al-Faihani (1980) note that in the south, fresher water of marginal quality occurs perched above the more saline regional water, except in a narrow zone near Dukhan where a small freshwater lens occurs, sitting directly on the saline water. They also show irrigation as only occurring scattered in the north with a main concentration of farming northeast of Jamailiyah, and a water well field to the north of Rawdat Rashid. However the salinity in the wellfield was marginal, ranging from 1284 to 2700 mg/L (FAO 1974). By contrast a wellfield near Al Jamailiyah had salinities of about 500 mg/L.

1.4.4.1 Isolated groundwater occurrences and areas of settlement in the south and west

Despite having a lower rainfall, it was also observed by Eccleston et al., (1981) that in the south, vegetation is more abundant permitted by a higher retention of infiltration near the surface. This is perhaps more a property of the sandier soils which permit faster infiltration into the shallow subsurface than in the case in the north, where the higher clay content of the rawdah soils tends to slow recharge. While a broad generalized view of groundwater salinity across Qatar is provided by the various salinity maps, a number of isolated areas are shown on Dastane and Al-Faihani (Figure 32) where fresh groundwater with a salinity of less than 1000 mg/L exists in otherwise saline settings - such as to the south of Turayna and to the east of Umm Bab near al Kharsa. It is likely that the fresher water represents several of a number of areas where despite deep regional water tables, localized recharge creates perched groundwater lying above the regional system. The latter situation was earlier suggested by Dastane and Al-Faihani (1980) who noted that in southern Qatar, fresh groundwater is confined to perched systems.

2 Regional investigations

It is clear that landscape relief and salinity play important roles in governing those areas where more permanent occupation and settlement may have occurred in the past, whatever

the time scale. The variable distribution of these two factors suggests that for occupation, the physical environment in the north of Qatar was far more hospitable than that in the south. In order to further test observations on landscape and occupation, a number of traverses were carried out, concentrating in the south but also re-examining areas in the north (Macumber, 2009, 2010, and 2011a and 2011b). This includes areas where earlier workers such as Kapel (1967), De Cardi (1973) and the French *Mission archéologique française à Qatar* who had demonstrated and excavated early occupation sites, such as at Shagra (Inizan, 1988), the Acila Depression and Al Khor (Inizan, 1982) and Tixier (1980). The Acila Depression to the east of Umm Bab (locality 'A' on Figure 33) was the centre of a study by the French who observed numerous surface scatters of early industries. In these instances sites were at low elevations in the landscape well within reach of the water table, with Al Khor and the Acila Depression representing northern locations with favourable hydrological settings, both with a shallow depth to water table and reasonable groundwater quality. While the Shagra site located in the south had a shallow water table, it was on the then (mid-Holocene) coast (Figure 79) and would have relied on local runoff probably collecting in shallow depressions in the dense limestone surfaces that made up the remnant Pleistocene strand line landscape (Figure 90).

Palaeogeography was important in site investigations in the south, since the southern coastline of Qatar has a number of large embayments which existed in mid-Holocene times when sea levels were higher than those at present. Adopting the 3 m contour as a mark of the then sea level, an approximation of the inland limits of the mid-Holocene sea level from 7000-4000 yr BP was obtained. At the time, a narrower peninsular connected Qatar and Saudi Arabia' This is shown as a corridor lying to the west of Sauda Nathil (Figure 33- locality G - and Figure 34). The lower adjoining areas not underwater were probably inter-tidal or active sabkha. This corridor would have been the principal (perhaps only) overland route taken for travel between the two countries. The corridor and surrounding areas provide a focus for future archaeological investigation.

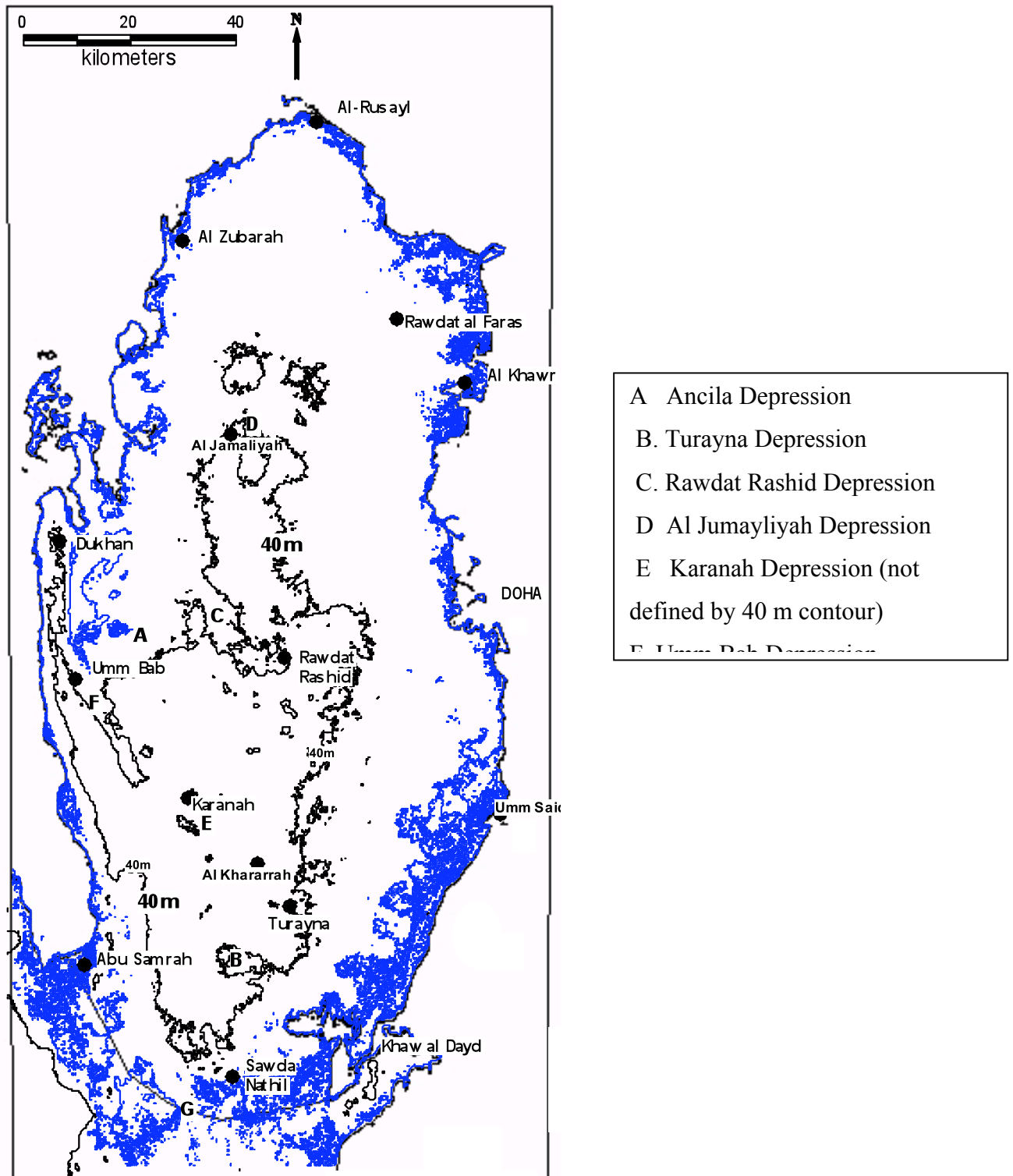


Figure 33 The 40 m contour and 3 m contour (blue) of Qatar showing highland depressions and the approximate extent of the transgression of the mid Holocene sea

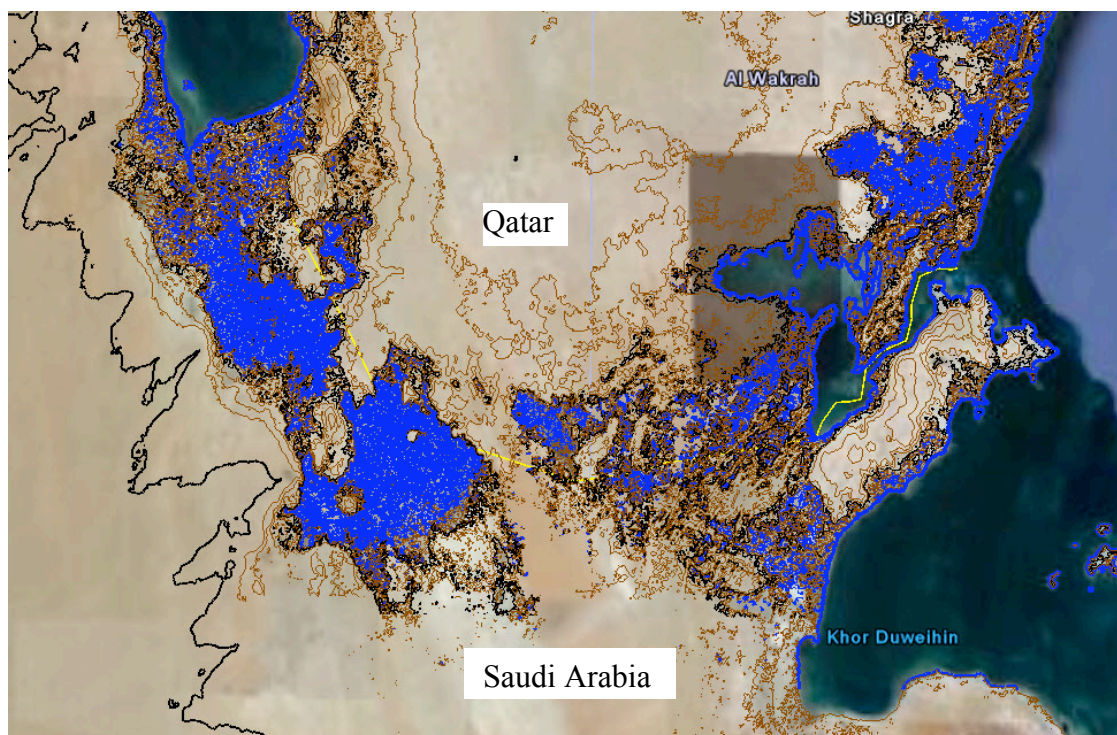


Figure 34 The former extent of the coast during the 7-4,000 yr BP period (blue) showing the corridor ('G' of Figure 33) connecting Qatar with Saudi Arabia

There were several different approaches to examining the relationship between water and occupation potential across different landscapes. One was to obtain perspective by re-examining the environmental and hydrological settings of a number of previously described sites in the south, starting with Shagra. The Shagra site in SE Qatar, perhaps best known for its fisherman's hut, is one of the earliest sites in Qatar. The Shagra site, excavated in 1982, provided an un-calibrated date of $7,520 \pm 90$ BP on marine shells (Inizan, 1988). Shagra was located in a depression on a Pleistocene strand line overlooking the sea during the phase of Holocene high sea levels. It now lies about 6 km inland from the Sealine Beach resort on the present coast. Priority in the 2012 field season was initially given to re-locating Shagra, as it was considered that this site may provide an understanding on the nature of early occupation (7,500-5000 yr BP) at a time when sea levels were higher and the southern coastline was strongly indented with large embayments.

2.1 Occupation in areas where there is little or no potable groundwater water

The above discussion is focused on the conditions required for settlement in Qatar; however there is strong evidence that people visited the less hospitable areas regularly, usually during

favourable seasons, when storm water temporarily ponded in the rawdah or accumulated in basins in the limestone, as probably occurred in the fossil shoreline and aeolianite areas in the vicinity of Shagra (see below). A fresh water requirement was not necessary for travel either within Qatar or on journeys to and fro between Qatar and Saudi Arabia, since camels are able to drink brackish to moderately saline water (Farid, 1989) and produce (fresh) milk. In this respect, they may be considered as portable desalination plants. Camel wells, established where groundwater was too saline for human consumption, enabled movement through areas where no potable groundwater existed, as was the case of much of southern Qatar. A historically well known example is at Muqshin on the edge of the a'Rub al Khali in central Oman where brackish groundwater upwells in Wadi Muqshin and rapidly becomes saline on evaporation. However the uppermost wadi areas and the wells around Muqshin have water with a salinity of 9,000 mg/L, unsuitable for drinking but quite suitable for camels. Muqshin was a starting point for journeys westward into the a'Rub al Khali. As Thesinger (1959) wrote of another case in Arabian Sands - "We tasted the water, but it was too brackish to drink; the thirsty camels, however, drank as if they could never have enough". Sites associated with camel wells are described in De Cardi, and one such well occurs adjacent to the high aeolianite outcrop to the north of Shagra where a number of artefacts and pottery were found (Figure 92).

3 Preliminary assessment of occupation potential in the south based on environmental considerations

The three seasons and part of the fourth season from 2009-2012 focused in the north of Qatar, and progressively pointed to more significant occupation than was previously understood. This was especially the case in Abbasid times, as reflected by the greatly increased number of linear settlements which are now recognized. However, while there was relatively little comparable work carried out in the south during Season 4, there is strong evidence that the water availability and potability favourable for settlement in pre-modern times in northern Qatar were not similarly present. This disparity was further explored in 2012 on the basis of records available from the 1950s through to the early 1980s covering the period of initial modernization of Qatar. In order to further test this understanding, part of the 2012 field season was devoted to inspection of southern areas which tested the hypotheses including both landscapes and archaeological sites previously recorded by De Cardi and the French Expeditions of the 1960s, 1970s and 1980s.

The approach encompassed:

1. A reconnaissance was undertaken to locate Shagra and examine the areas adjacent to the mid-Holocene shore line near Shagra: this included the small peninsulas protruding into the mid-Holocene sea on which Shagra occurs.
2. Attempts were made to find sites previously recorded by De Cardi (1973) in the south, and examine their location relative to the landscape in which they occurred. Of additional interest was the relationship of sites to the narrow isthmus that connected Qatar to Saudi Arabia when the sea level came furthest inland between 7,500 and 4,000 yr BP.
3. An inspection was made of the larger, higher level inland depressions where settlement (if present) would have relied on locally recharged freshwater lenses, wherever the lenses were within reach from the surface by hand-dug wells. To this end, the 40 m elevation contour provides a basis for examining the distribution of the larger depressions, (except in a few cases such as the depression to the east of Karanah where the depression rim is defined by the 50 m contour, the floor more generally at 40 m, and the lowest point at 29 m). In these instances, while the inspections were wide ranging, no detailed survey work was carried out. They were sufficient, however, to enable a comparison between occupation density and form in the south with that in the north. The work was commonly interrupted by sand storms, reflecting the sandy nature of the south, and perhaps the time of the year. During the excavation at Shagra in 1982, Inizan notes that the work was interrupted because of a prolonged sand storm.

3.1 The nature of a localized freshwater lens - the Ma'abar Depression, Al Wusta, Oman

For perspective on the nature of a freshwater lens likely to have developed in a similar topographic, climatic and geological setting to those of the Turayna and Karanah Depressions in Qatar, reference was made to the hydrogeological study of the Ma'abar Depression in the hyper-arid central Oman desert (Macumber 1994; 2003) where a small number of bores were used to irrigate several small farms in the southern of the depression (Macumber et al, 1994). The floor of the Ma'abar Depression lies 5-10 m below the surrounding Eocene limestone plain and 19 bore holes were drilled in a number of section lines across the depression. In

general the groundwater in Al Wusta is saline, other than where such localized freshwater lenses have developed, with fresher groundwater occurring at depths of 50 m or more below the surface (Figure 36 to Figure 38).

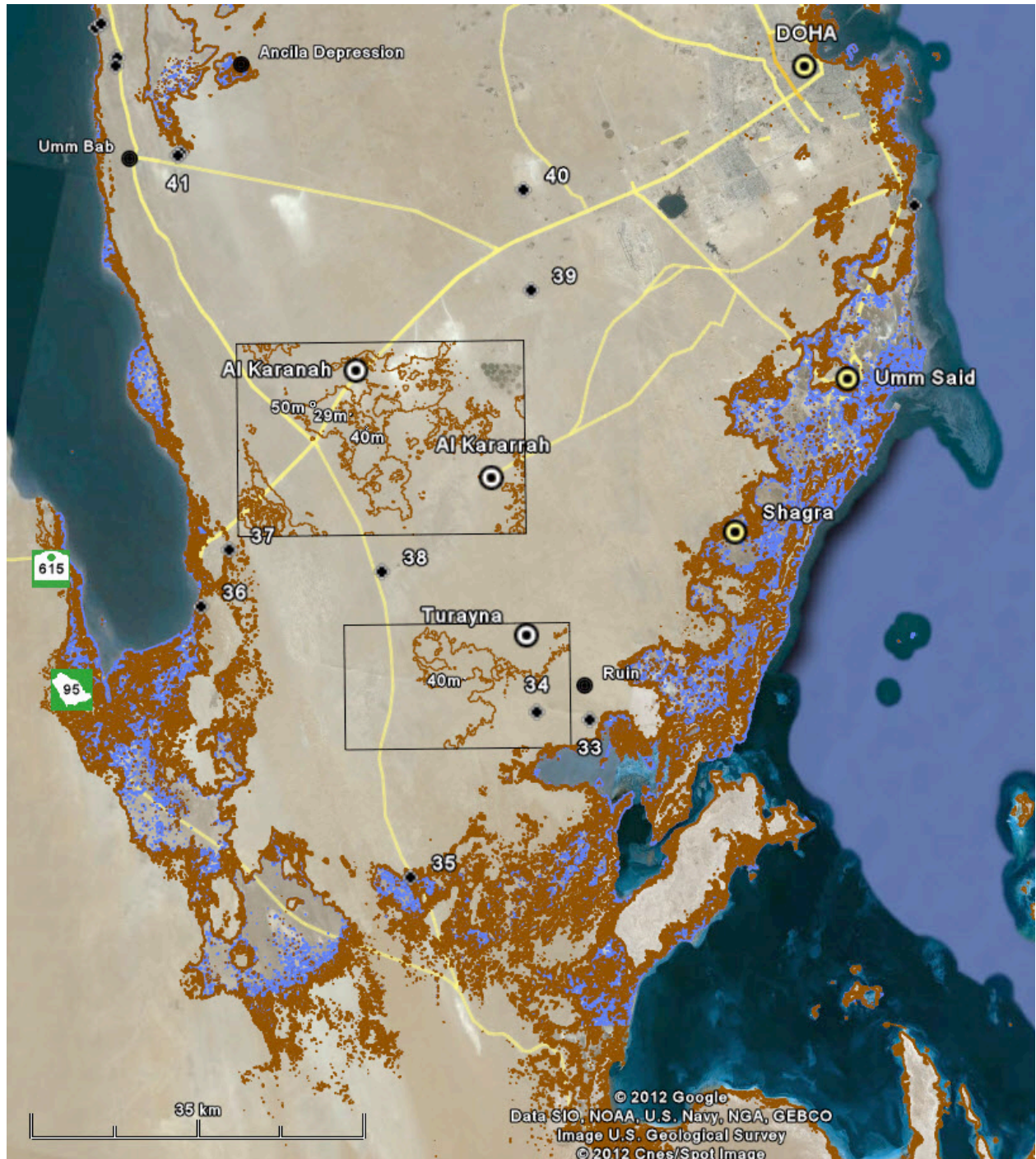


Figure 35 The Karanah, Turayna and Ancila depressions (contoured), De Cardi sites (numbered), the mid-Holocene shoreline, Shagra site and the connection with Saudi Arabia

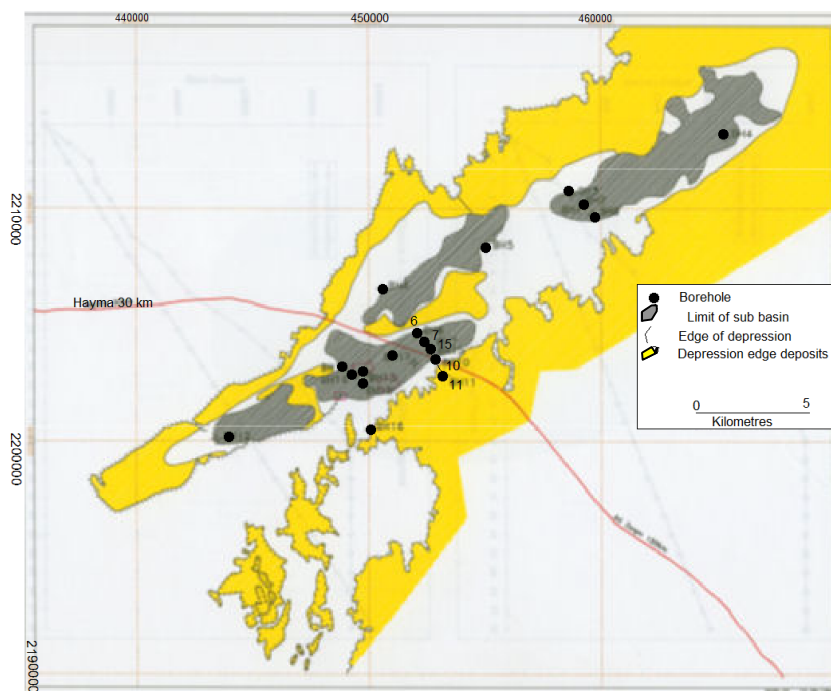


Figure 36 Ma'abar Depression, Al Wusta, Oman

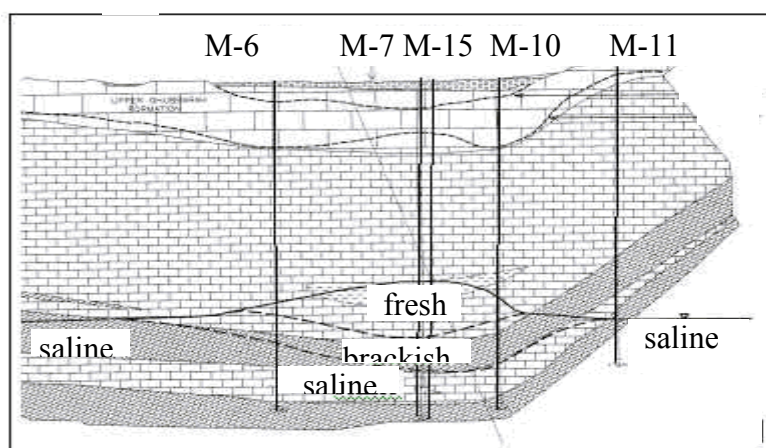


Figure 37 W-E Section through the freshwater lens at the Ma'abar Depression, central Oman
(diagrammatic)

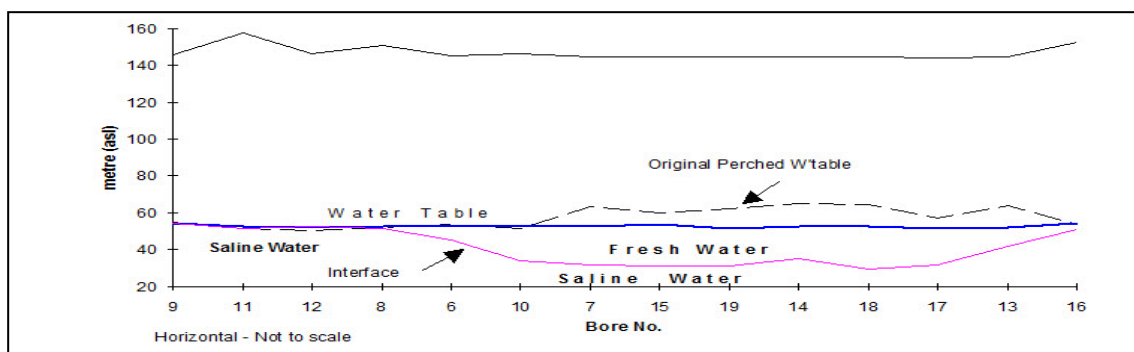


Figure 38 Depth and thickness of the freshwater lens at the Ma'abar Depression, central Oman - diagrammatic

The Ma'abar Depression consists of a number of shallow linked depressions extending for about 25 km in a NE-SW direction. It is a maximum of 4 km. wide. A drilling program, covering the entire length and breadth of the depression, showed that the freshwater lens was restricted to a southern sub-basin where the lens is about 4 km long and 1 km wide. In the area underlain by fresh water, surface water ponds during infrequent heavy rainfall events and recharges the limestone aquifer. Recharge is enhanced by localized run-off from the basin sides and by a small wadi which enters the Ma'abar depression from the south. A second freshwater lens occurs in the Haima Depression about 30 km to the west, and studies covering both the Ma'abar and Haima Depressions study show that the top of the freshwater lens is only a little higher in elevation than the top of the deeper adjacent saline water table. The 19 bores at Ma'abar were sampled vertically at 5 m intervals during drilling for both chemistry and stable isotopes (Macumber, 2003) .

The high tritium values recorded in the Karanah Depression suggest that a similar situation may exist beneath some of the larger Qatari depressions, and if fresher water were attainable by hand-dug wells, more permanent occupation may have been possible. An objective therefore was to examine these depressions to see if evidence for occupation might be present, including that based around hand-dug wells.

3.2 Selected depressions in the south

3.2.1 Karanah Depression

The Karanah Depression (locality: site 'E', (Figure 39)) is a large N-S depression lying to the east of Karanah on the Salwa Road. High tritium levels were recorded in a number of bores indicating significant modern groundwater recharge within the past 50 years, and perhaps the presence of a freshwater lens. The tritium values are shown in Figure 38 (in red). with highest values (between 21.4 and 67.5) to the north of Karanah.

The rim is at an elevation of about 50 m ASL, while the floor of the Karanah Depression is mostly between 30-40 m, but reaches a low of 29 m in the central area to the south of Karanah, at Umm al Jarathim, to the south of Karanah. Given a potentiometric surface of about 4 m above sea level, the depth to the water table beneath Umm al Jarathim, whatever its salinity, would have been at a depth of about 25 m below the ground surface.

The surface of the Karanah Depression is markedly different in the north and south. In the north, the landscape is more stony with large areas of rocky broken surface, while in the south the base of the depression is a flatter, even surface. A number of bevelled surfaces form the edge of the depression. In both cases small sparsely treed depressions occur. A number of sparsely treed depressions were observed in the north; however ruins in the form of a two-room moderately recent structure were observed in one instance (Figure 40 and Figure 41).

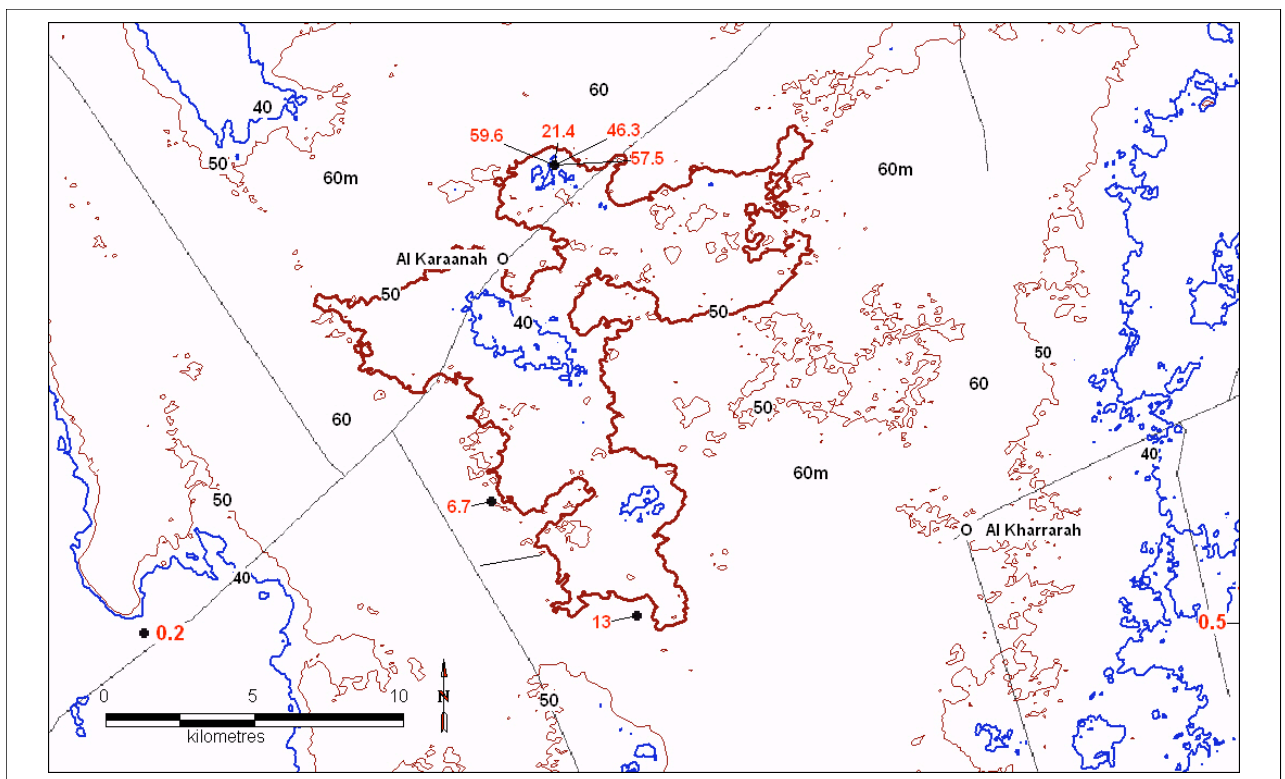


Figure 39 The Karanah Depression (marked by 50 m contour) showing wells where high tritium content indicated significant groundwater recharge. Tritium values are shown in red as tritium units.



Figure 40 Lightly treed depression with walls in the foreground - Karanah Depression



Figure 41 Ruins consisting of a two-room structure on the edge of a rocky, treed depression northern Karanah depression.



Figure 42 Flat landscape of the southern depression, showing alluviated floor - southern Karanah Depression



Figure 43 Circular structure - southern Karanah Depression



Figure 44 Qibla with mihrab - southern Karanah depression



Figure 45 Small structure near (above) mosque on the edge of a lightly vegetated depression



Figure 46 Bevelled landscape formed by structural benches within the Dammam Limestone - southern Karanah Depression



Figure 47 Light covering of grass and scattered bushes across flat mini-depression - southern Karanah Depression

Summary: while a detailed examination of the Karanah Depression is necessary before a proper assessment is made of the occupation status, the brief examination here indicated some limited structures including a small mosque associated with small sparsely treed depressions. Although indications of (seasonal) visitations were present, there was little evidence of pre-modern permanent settlement, and the walls shown in Figure 40 and Figure 41 represent more recent occupation

3.2.2 The Turayna Depression and surroundings

The Turayna Depression lies to the south of the Karanah Depression and is elongated in a similar direction, suggesting that they are both structurally controlled (Figure 48). Only the 50, 40 and 30 m contours are marked, but they clearly show the landscape asymmetry on passing eastwards across southern Qatar, evident from the surface shown in Figure 30.

Approximate positions of numbered sites previously recorded by De Cardi (1973) are shown, one of which occurs in the northern-most area of the depression (site 38) and two others to the southeast, beyond the depression (site 33 and 34 - Figure 48). The rim of the depression is at about 50 m, while the deepest parts of the depression in the south lie at elevations of about 30 m, and in this respect they are at similar level to the low points in the Karanah Depression (29 m). The depression is not fully enclosed by the 40 m contour, while the 30 m contour passes unbroken across the outlet, suggesting that whatever drainage may have occurred in the past (or at present) is graded to that level. Evidence of incipient drainage probably following storms, in the form of eroded banks was present in places along the depression

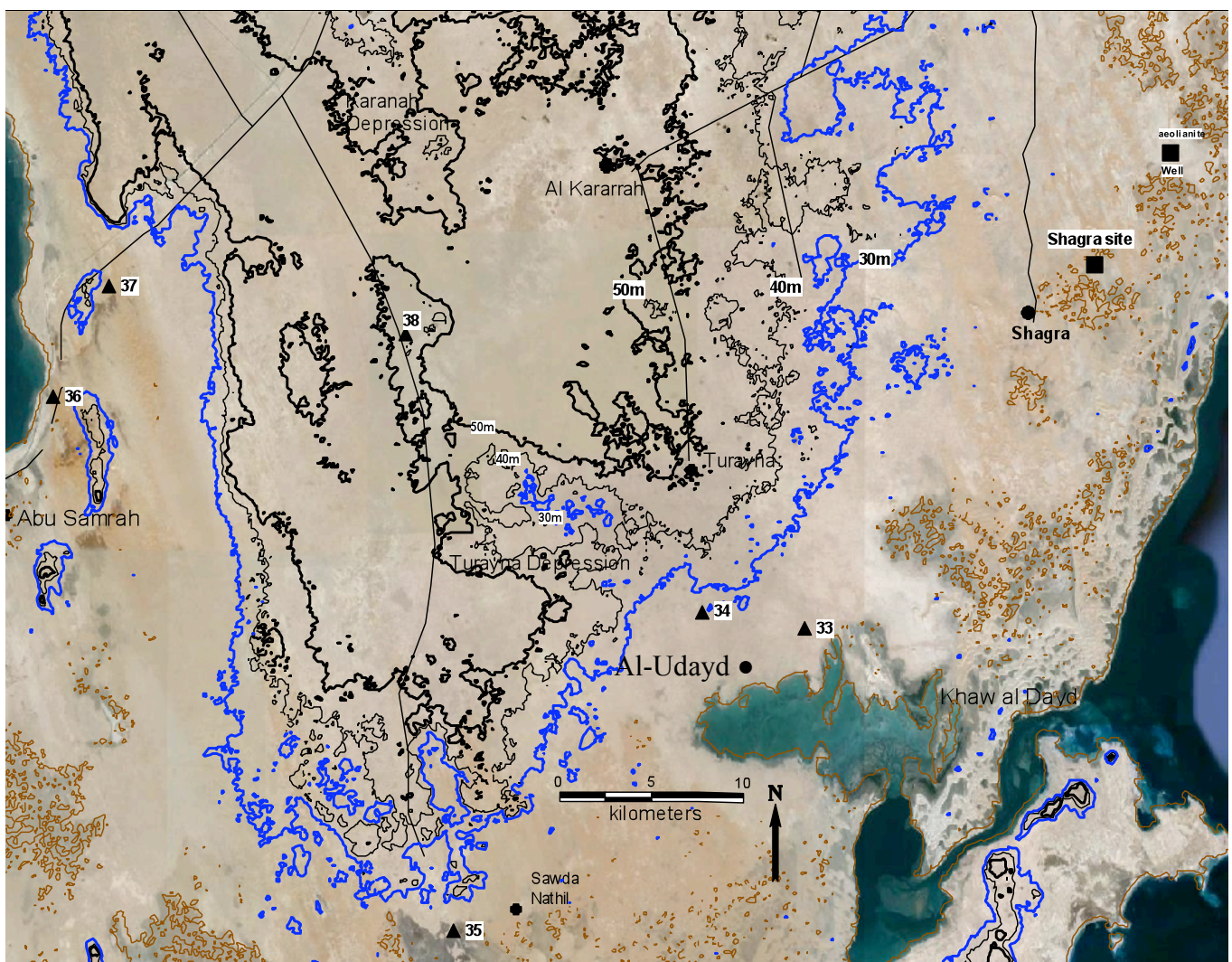


Figure 48 Southern Qatar showing the Turayna Depression and surroundings, with numbered De Cardi sites

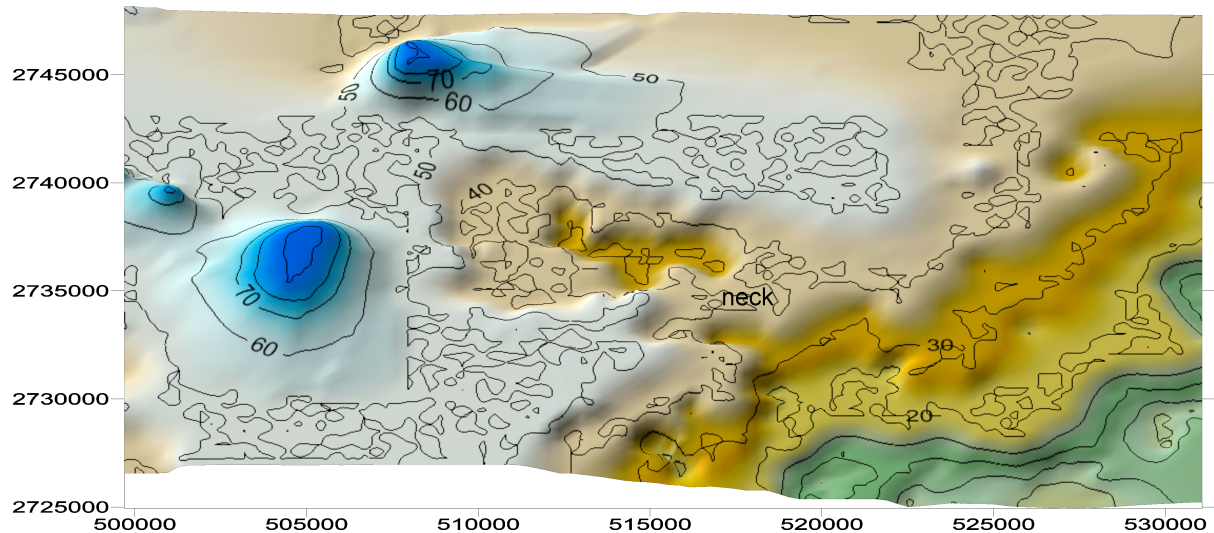


Figure 49 Topographic map of the Turayna Depression showing the 'neck' and outlet to the east

Figure 49 shows the Turayna Depression incised into a terrace-like surface developed between the 40 and 50 m contours with its base about 30 m. It is uncertain as to whether the terrace is a structural bench or an erosional feature. From Figure 30, it can be estimated that the depth of the water table under the pre-modern regime was about 25 m or more, which was probably beyond the depth of hand-dug wells. This may not have been the case during the latter part of the wetter period, between 6000-7000 years BP. Evidence of stream activity is seen in the incision of the wadi floor. Flow events reflected by the incision are likely to have also been recharge events into the limestone aquifer.

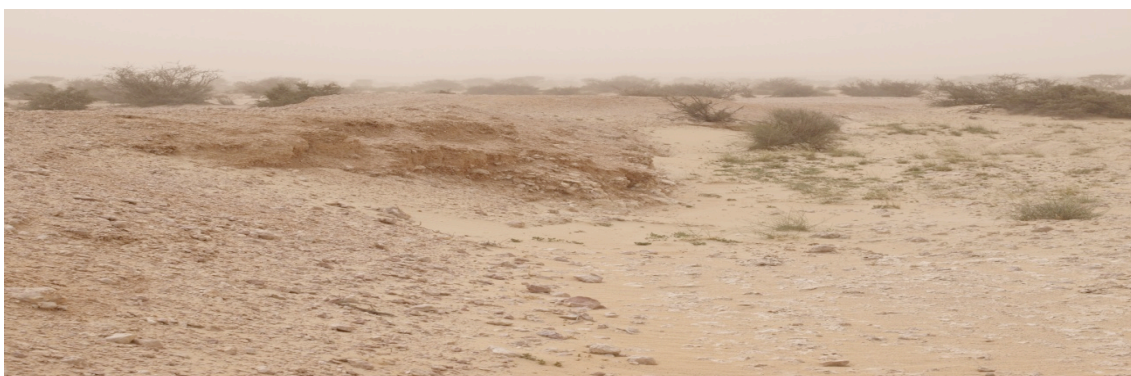


Figure 50 Stream course and eroded bank in the Turayna Depression, exposing wadi deposits

Towards the southern (lower) end, outlined by the 40 m contour, the depression narrows to a small neck prior to opening onto the plain. A number of features are present in the small

semi-treed basins. They include a farmlet and circular sites associated with burned and splintered bone. Although much of the floor of the depression is bare or covered with sand, there are a number of small sub-basins in and adjacent to the depressions that have thinly scattered vegetation. On the northern edge of the Turayna Depression in a small treed depression was a small mosque consisting of a mihrab and low qibla wall (Figure 52 and Figure 53).

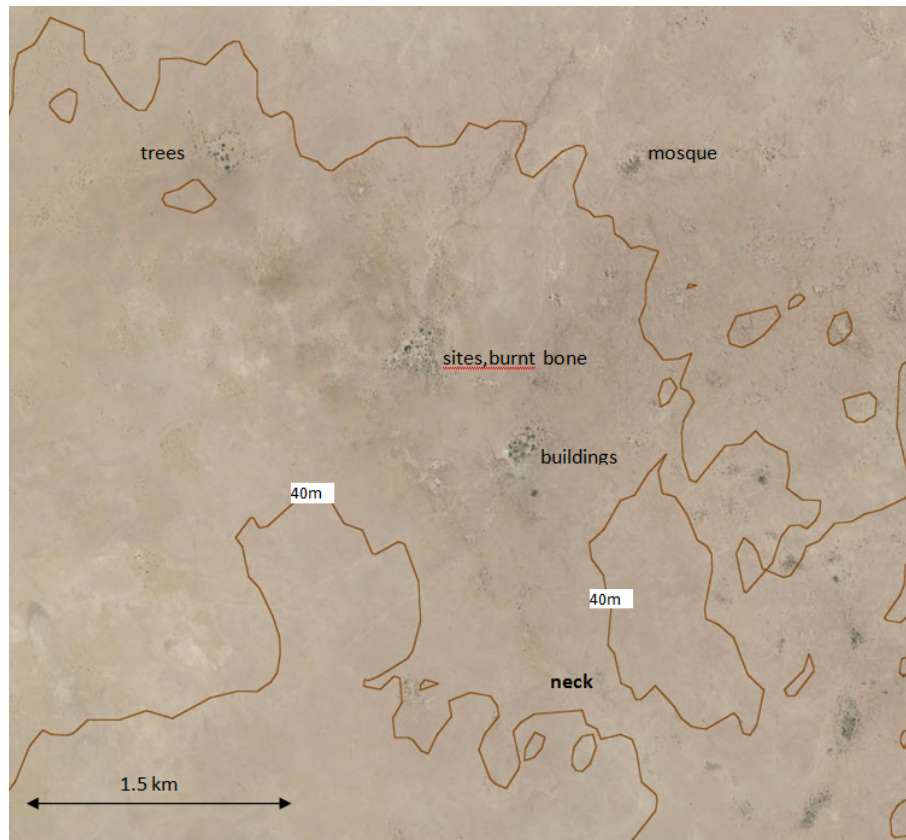


Figure 51 South-eastern part of Turayna Depression with locations of the mosque, farmlet and site with burned bone in treed basins



Figure 52 Stony and sandy depression floor at mosque site (top left)



Figure 53 Mosque in a small sparsely treed depression on the edge of the Turayna Depression



Figure 54 Lightly treed and grassy depression, adjacent to higher areas with structures and burned bone (foreground)



Figure 55 Structures on higher ground, adjacent to the treed depression



Figure 56 Structures on higher ground adjacent to the treed depression - during sand storm



Figure 57 Burned and shattered bone on the ground alongside structures



Figure 58 Burned and shattered bone (detail)

The floor of the Turayna Depression became flatter and sandier on passing up-basin and while a number of sparsely vegetated depressions were examined, there was no indication of significant occupation comparable with that occurring in the north. De Cardi (1973) considers her site 38 (locality Figure 48) which occurs in the northern part of the Turayna depression, as an intermittently used camping ground. This is likely to be the case with other sites in the depression, as is also suggested by the presence of the isolated mosque (Figure 53).

3.3 Areas to the east of the Turayna Depression

3.3.1 De Cardi sites 38, at the western limits, and sites 34 and 35 to the east of the Turayna Depression

Site 38 is at the western limit of the Turayna Depression, where it merges with the plains. The location of De Cardi sites 33 and 34 (locality Figure 48 and Figure 60) are down-valley from the mouth of the Turayna Depression, but also to the north of Khor al Udayd. Several other sites were also recorded in the region. The Al Udayd sites 'B1-4', and the village ruin "V" (Figure 60). The Shagra site, located in this survey alongside the G-8 triangulation point, is also shown on the mid-Holocene inland shoreline roughly marked by the 3 m contour.

The sites lie at elevations of between 10 and 30 m above sea level, and there is a steep southwards fall to the coast. Site 34 lies just to the west of the main track passing southwards through Turayna. Although not recorded by de Cardi, a further site of an abandoned village (Site "V"), now a ruin, lies 3.5 km to the north of site 33. Site 33 is close to the Khor al Udayd.



Figure 59 Landscape adjacent to Khor al Udayd (background)

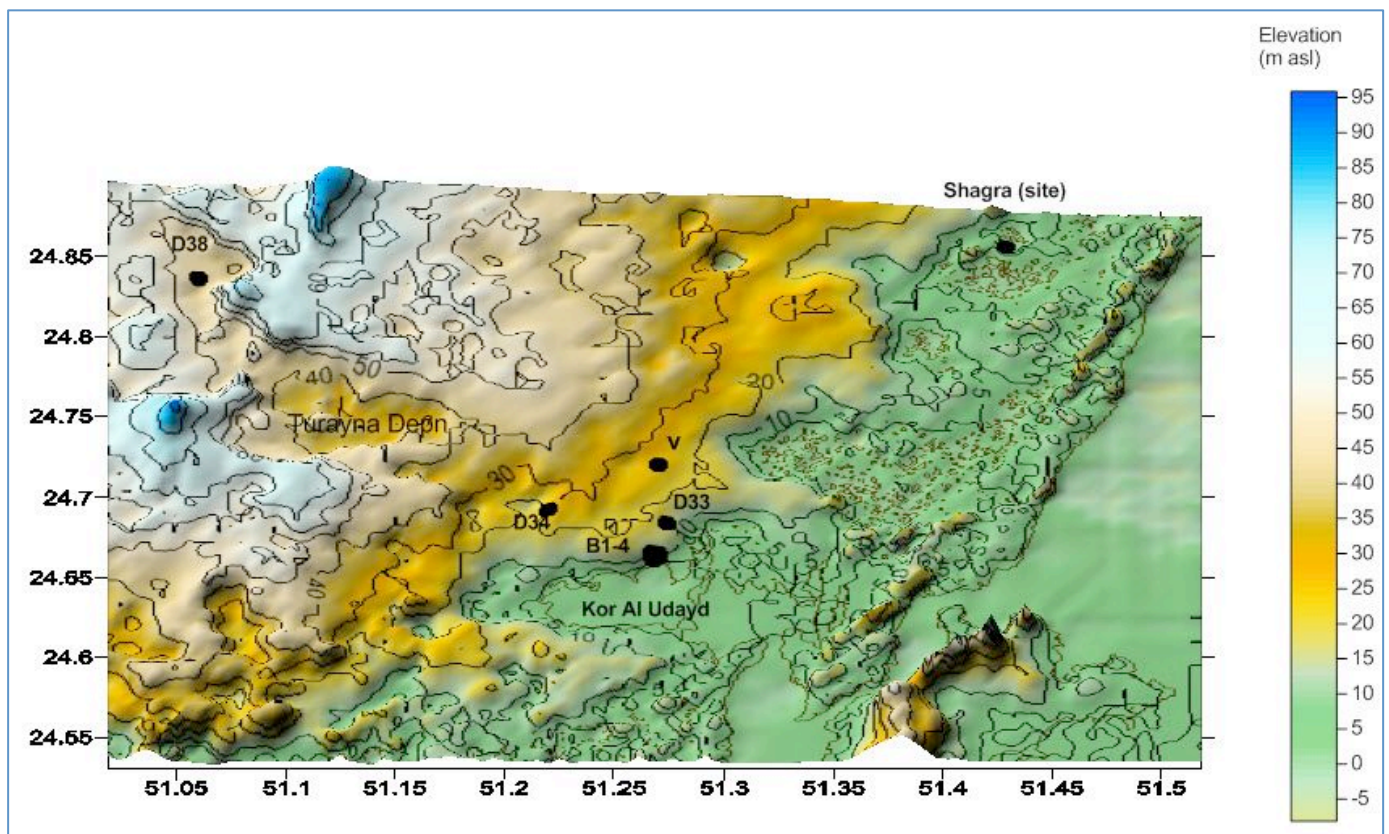


Figure 60 Topography and sites downbasin of Turayna Depression

3.3.2 De Cardi Site 38, Al-Huraiti district - uppermost catchment of the Turayna Depression.

De Cardi (1973) notes that: *to the east of the new road to Sauda Nathil a scatter of potsherds and dreikanter lay on the plain near a ruined dwelling. The sherds, of sixteenth- to nineteenth-century date, extend to the foot of the mesa and occur also on some of the small terraces leading up to the top of the plateau. The area was probably used intermittently as a camping-ground and several stone-built graves were noted on a hillock in the same area*

The flat plain on which Site 38 occurs has several modern houses/farms on it (Figure 61). It lies at the far western edge of the Turayna Depression. There is little likelihood of concentrated surface run-off to provide significant recharge supporting any permanency of occupation. De Cardi's description of the site as being an intermittent camping ground readily matches the landscape.



Figure 61 Plains adjacent to De Cardi's site 38

3.3.3 De Cardi Site 34. Al-Qusairah (Gusaurah)

De Cardi notes: *The Danish Expedition had located a site on level ground behind a dune on which both flint implements, and pottery were noted and reference was made to a cairn nearby (Kapel, 1965, 155; 190,36, Site Q.62.8). An attempt was made to visit the area in order to check on the nature of the pottery but it proved impossible to find the site. Instead, several cairns and a camping-ground were noted in a large depression enclosed by relatively high rocky ridges. Stretches of abandoned cultivation occurred on patches of silt, and its sheltered position makes it likely that the area has been occupied from time to time for centuries although none of the surface pottery could be ascribed to a date prior to the seventeenth century – De Cardi 1973.*

3.3.3.1 Landscape in the vicinity of De Cardi's site 34 at Al-Qusairah

De Cardi's site 34 lies down-basin of the Turayna Depression and a little to the south of Al-Qusairah, which in turn, lies near the junction of the main north-south track from Turayna and a track passing eastwards to San Ad Dhiban and San al Fuzaylan. The landscape in the vicinity of Al Qusairah and site 34 is rocky and broken (Figure 62) with large basins containing small grassed depressions. Unlike the rawdah in the north the depressions commonly have steep edges (Figure 62 and Figure 63). The broken nature of the region is probably in part a reflection of its proximity to the mouth of the Turayna Depression and perhaps from headward erosion by small coastward passing wadis. It may also reflect structural movements associated with a faulting system affecting the Turayna and Karanah basins. It is likely that the depressions would hold water for periods after heavy storms, and in one sandy depression a tiered cistern-like dam was constructed (Figure 64). It is notable that De Cardi records that in the Qusairah area there were stretches of abandoned cultivation, and it may have been occupied from time to time over centuries. Whether the Turayna Depression acts as a catchment area for surface and / or groundwater flow into the Qusairah district requires additional investigation.



Figure 62 Rocky landscape with rimmed depressions near Qusairah



Figure 63 Large rimmed depression in the vicinity of Qusairah



Figure 64 Tiered walls and dam at the base of a depression, fed by a number of inlets



Figure 65 Drainage line feeder to the tiered dam

3.3.4 Ruins near San Al Fuzaylan

About 4.5 km east of its junction track from Turayna, on the track passing eastwards, lie the ruins of a small settlement roughly located between San adh Dhi'ban and San al Fuzaylan. At San Adh Dhi'ban there was a large Bedouin encampment in a treed depression. The ruins were located on another treed depression about 1 kilometre to the northeast in a small, sandy wadi with a central walled well (Figure 67). It is likely that the sandy wadi floor enabled sufficient infiltration to permit a small localized groundwater lens to develop. A feature of the site was the presence of two mosques - a smaller one in the wadi (Figure 68) and a larger one on the rim, overlooking the village (Figure 66). The smaller of the two mosques had a small mound at the southern end of the qibla wall, a feature earlier observed in the mosque in the Turayna Depression (Figure 53).



Figure 66 Mosque on hill above ruined village



Figure 67 Walled well in wadi



Figure 68 Small mosque in wadi.



Figure 69 Square (upper middle ground) and circular structures (centre right) on the wadi floor



Figure 70 Circular structure with central raised area on the wadi floor



Figure 71 Two roomed structure on the wadi floor.



Figure 72 Hill overlooking the wadi with large mosque on the skyline



Figure 73 Small runnel where run-off from the surrounding bare limestone surfaces enters the sandy wadi

3.3.5 De Cardi Site 33 - Khor Al Odeid

De Cardi (1973) notes: *A cairn and some surface pottery were found on a stretch of ancient coastline near the main track leading west from al-Odeid Police Post. The pottery was scanty but included a coarse hand-made pink ware containing large white grits, cream-slipped externally; part of a cylindrical vessel, and a flat base with slight internal knob-a feature not noted on pottery found elsewhere in Qatar. No date could be ascribed to these sherds. Three tile scrapers were collected in the same area.*

A group of cairns was located on rising ground looking south towards the inlet about 5 km. to the east of al-Qusairah. The cairns lie north of the coastal track in an area which contained another feature of interest. This appeared to be a prominent hillock bearing traces of masonry which may represent the remains of a hum or a dwelling. In the same area and along a level stretch leading towards the track were a number of shallow pits, possibly old camp fire-pits to judge from the ash in several of them. No pottery was found either on the hillock or near the cairns and their date is unknown

3.3.5.1 The Al Udayd Sites to the south of De Cardi's site 33

In the Al Udayd area there were a number of features noted close to the main west-east track about 2 km to the south of De Cardi's site 33 (marked as 'Al-Udayd' - Figure 48). These include three small stone circles and several cairns (site B1-4, Figure 60). The proximity of the Khor Al Udayd is shown in the background of the cairns in Figure 74.



Figure 74 Cairns at Al Udayd site "B 1-4" of Figure 71. Khor Al Udayd in the background



Figure 75 Site B1-4 Small circular structure - Khor Udayd in background



Figure 76 Site B1-4 Small structure with two compartments

3.4 Area to the south-east of Turayna

Alongside a track which passes south east from Turayna is a small mosque in a sandy lightly treed depression. The mosque is typical of a number of similar mosques scattered throughout the southern desert in Qatar, and consists only of qibla and mihrab.



Figure 77 Mosque consisting of qibla and mihrab on the track SE of Turayna in a lightly treed sandy depression



Figure 78 Mosque on track SE of Turayna in lightly treed sandy depression

In a more general sense, the isolated qibla-mihrab mosques found scattered across the landscape in the sandy treed depressions of southern Qatar are indicative of a through-moving nomadic population, where regionally sourced potable water was either absent, and water if present occurred as small localized recharge lenses or as ephemeral pools or shallow

groundwater often present only after storms. Whatever the case, shallow brackish hand-dug wells, wherever present, were a perennial source of drinking water for camels. The picture is one which is supported by De Cardi's observations that the sites she observed often represented intermittent camping grounds. This was also the case with most of the sites observed during the southern reconnaissance.

While the qibla-mihrab mosques are a feature of southern Qatar, they are also found in the north, where they are interspersed with the more common walled mosques, and permanent settlements. The form, distribution and numbers of the mosques perhaps best reflects the different hydrological settings across Qatar. Yet in the north, away from the larger settlements, qibla-mihrab mosques are also found. One of the most interesting mosques located during the reconnaissance was that at Haddayah, where a simple qibla-mihrab mosque was located at the north-east end of an Abbasid linear settlement (Figure 101).

4 Al Shagra?

4.1 Re-location

As part of the Copenhagen University initiative in Qatar, an objective was to gain further perspective on the relationship between occupation and the physical environment (past and present) across Qatar. This sought to establish the relationship existing between occupation on the one hand and the environment - groundwater occurrence (and potability), geomorphology, paleoclimatology and sea level changes - on the other. That is, to examine where and how people lived in pre-modern Qatar, given its low relief and lack of surface water. While the main thrust in the previous three years has been in northern Qatar, it was considered that a more balanced perspective could be had by examining and comparing the northern situation with selected areas and sites across southern Qatar.

Of special importance to this objective was re-finding the 7,000 year old site at Shagra, excavated by the French in 1982, since, apart from having the oldest discovered house in Qatar (a fisherman's hut), it might provide perspective on what to look for elsewhere in the south, especially in similar paleoenvironments, which are recurrent down the SE coastline and along the shores of the Inland Sea. An initial attempt to pursue this objective was carried out in 2011, by approaching the area of the Shagra Camel Station from the west. However, this was unsuccessful, and only afterwards it was found that the Shagra archaeological site is

wrongly placed on the French maps, being shown as about 4 km to the south-east of the Shagra camel station. It was discovered early this season (2012) by means of an airphoto (Fig 46) in Inizan Vol 2 MAFQ that it was to the north-east not the south-east of the camel station, and lay in the vicinity of the G08 Triangulation (Trig) Point (coordinates 51.42836 E, 24.85163 N) located on an ancient Pleistocene marine strand line (Figure 82).

4.2 Shagra fisherman's hut

The following extracts are taken from Inizan: Mission Archeologique Francais to Qatar (MAFQ) Vol 2 which clearly identifies the locality as being close to Triangulation Point G8, located about 6 km west of Sealine Beach:

The French note - *The preliminary study of aerial photographs (Fig. 46), enlarged to a scale of 1/50,000, has permitted a systematic and precise survey*” – Inizan , MAFQ Vol2 2 p 99. and that *"the fragments of former Quaternary marine (strandline) emerging from the dunes as G.8 (geodetic point) form a bar 2 km long with an altitude of several meters or even small massifs to the north of a vast salt lake*

“Discovery of a structure

A concentration of lithic artifacts was initially noticed around triangulation point G8. Further inspection revealed an oval structure (5 x 3 m) which sloped gently to the south and was delimited by partially embedded sandstone slabs. The association of artifacts and structure seemed sufficiently coherent to justify excavation - and

The fragments of former Quaternary marine emerging from the dunes at G.8 (geodetic point) form a bar 2 km long with an altitude of several meters or even small massifs to the north of a vast salt lake. The presence and the relative wealth of lithic assemblages counted on the Quaternary marine surface not only pose the problem of the date and duration of these occupations, but also the significance of their geographical situation.

It is also in this region that H. Kapel obtained in 1965 the first radiocarbon date for a layer for which the industry is only lithic, from flakes debitage (5020 ± 130 B.C.).

The airphoto (Fig 46) showing the general district in the Inizan report, was turned at 90 degrees to north. On righting it, a match was found from both Bing and Google Earth (see below) using the N-S white arcuate Pleistocene strand line, shown in the north of the figure

(Figure 80). The Shagra site (as does Trig Point G8) lies on a further strongly dissected ancient ENE-WSW beach ridge strand line further south (Figure 81).

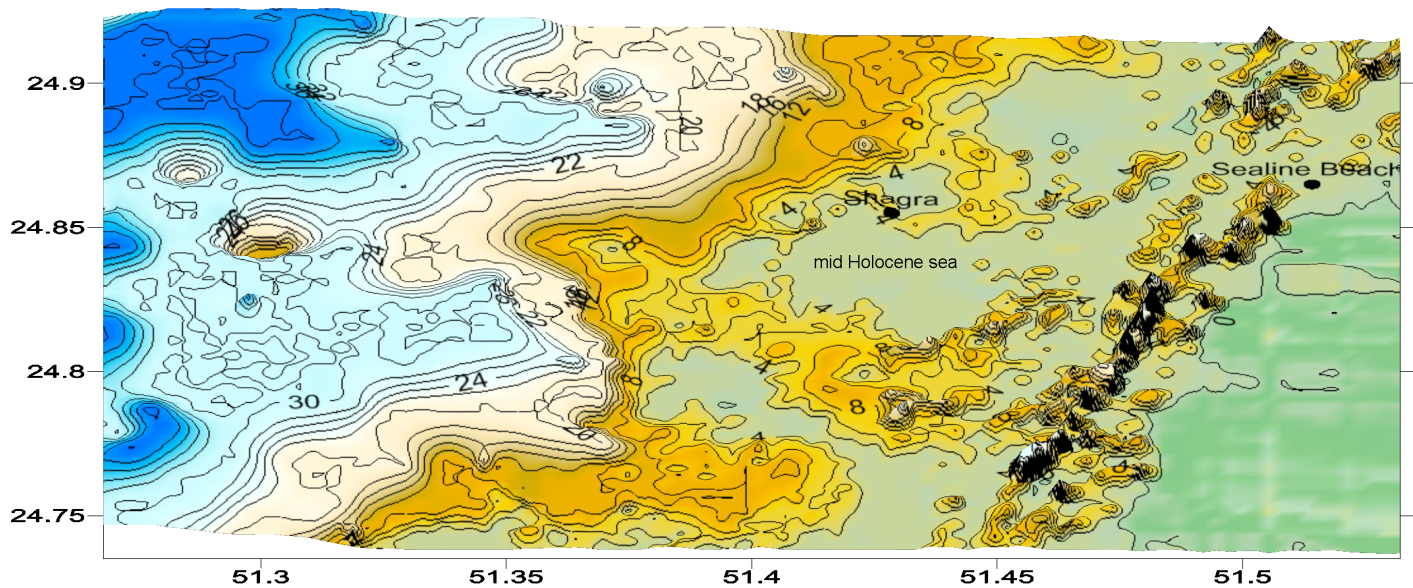


Figure 79 Diagrammatic view of the Shagra site on the shore of the mid-Holocene sea

A white terrace of marine sediments forms a pediment to the eroded strand line and this represents a boundary of rising ground to the north of the mid-Holocene (Flandrian) shoreline. The transgression created a number of similar marine embayments along the south-eastern shoreline of Qatar. A simple topographic figure based on data from the NASA Shuttle Radar Topography Mission (SRTM) enables an view of the topography at the time except for the line of high peaks along the present coast to the south of Sealine Beach, which is the modern coastal dune system (Figure 79).

There are several views on the age of the Pleistocene strand lines. The traditional view based on sea level curves, is they may represent the second- last marine transgression to impact on Qatar, which occurred in the Eemian Period about 113-120,000 years ago (Macumber, 2011). An alternate, more recent view, is that the palaeo dunes and terraces commonly attributed to the Eemian period formed more recently, only 20-45,000 years ago (Wood 2011; Jerry Jameson pers. com.), and that their present elevated position reflects uplift along the southern margins of the Gulf. Vita-Finzi (1973) obtained a radiocarbon date a little further to the west of G8 on shells from the strandline of > 35,000 years, while Dr Jerry Jameson (pers com) has additional more recent dates. Whatever the case, during the time of the later Flandrian transgression from ca 7000 to 4000 yr. BP, the older Pleistocene strand line at the Shagra site

bordered the transgression (Figure 79). It was previously noted in Inizan (988), that Shagra was on the seashore (see below). The ENE-WSW Pleistocene strand line feature is clearly visible on the enlarged Google and Bing photos (Figure 81) .



Figure 80 a and b. Re-oriented Air photo from MAF report (left) with matched figure from *Bing* (right)
Note N-S arcuate strand line and 'G8' marked in the bottom of the MAF picture

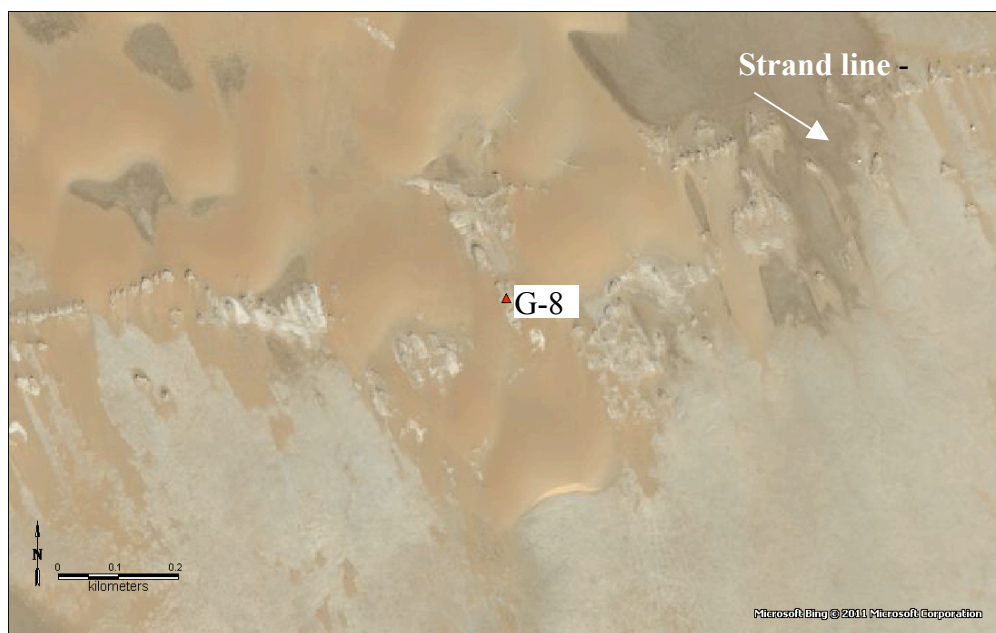


Figure 81 Picture from Bing with red Trig point 'G-8' shown, and the ENE-WSW strand line passing through G8



Figure 82 a and b. G08 trig point looking south. The trig point sits on the Pleistocene strandline.

Inizan (1988) notes that at G8, retouched bifacials dominate:

The prehistoric inhabitants settled in a depression of the ancient consolidated [?] Quaternary; indeed, the area of occupation is surrounded by heavily eroded mounds of sand in the form of consolidated sandstone that dominate still; the geodesic point G.8 located 2 meters above the structure has as its absolute elevation 29# meters – Inizan p 124.

The topography and the recording of the structure have been carried out (fig. 48). The proximity of the geodetic point G.8 helped connect it to the grid and specify the location of the structure in the morphology of the landscape - Inizan p 99

*The remains are only lithics along the high bar and only alongside the sabkha the lithic industry left on site is very sparse. At G.8 the technique of retouched bifacials dominates but it is not exclusive since 28 meters southwest of point G.8 a ridged blade and a blade tip on a shaft have been collected; they are identical to those from sites 36”**

*Site 36 is in or adjacent to the Acila Depression east of Umm Bab).

The elevation of 29 m is clearly wrong, as G8 is shown as being at a height of about 8 m on available maps and this fits with the floor of the adjacent sabkha being only several meters above sea level

In the vicinity of G8 are four heavily corroded iron marker pegs (French?), three still in the ground, of which two are shown in Figure 83.



Figure 83 Corroded iron pegs in the sand near trig point G8 – perhaps marking the excavation site and hence the structure. Note the corrosion on the nearer peg

From the above it seems clear then that the location of the Shagra excavation area lies in the immediate vicinity of the G8 trig point (see note below), where perhaps the site was originally discovered during its establishment.

Location of Fisherman's hut (Inizan, 1988)

It is therefore with surprise, after identifying a concentration of lithic items around geodetic point G.8, that an oval structure, limited by vertical 'daile' partially buried, was found (fig. 47). It is currently protected by a rounded barchan dune that dominates it, the advance guard of a dune extending over several hundred meters to the north.

The precise position of the French excavation is not clear however the most likely place is within a short distance (a few tens of metres) north of G8 perhaps marked in part by the iron pegs (Figure 83). Nearby cars have left numerous tracks across the suspected site as they have driven from the dunes onto a depression in the ancient shoreline sequence near G8 (Figure 87).



Figure 84 Surface of eroded strand line at G8



Figure 85 From near G8 looking south

While there was no significant density of stone material, small pieces of flaked brown vitreous chert not native to the site were present at the time of a short visit, and a small limestone scraper was obtained. Inizan (1988) notes: *“This group which practiced coastal fishing, was probably established on the seashore close to where the nearby sabkha marks the former shoreline, during the maximum of the Flandrian transgression here six or seven thousand years ago”*.

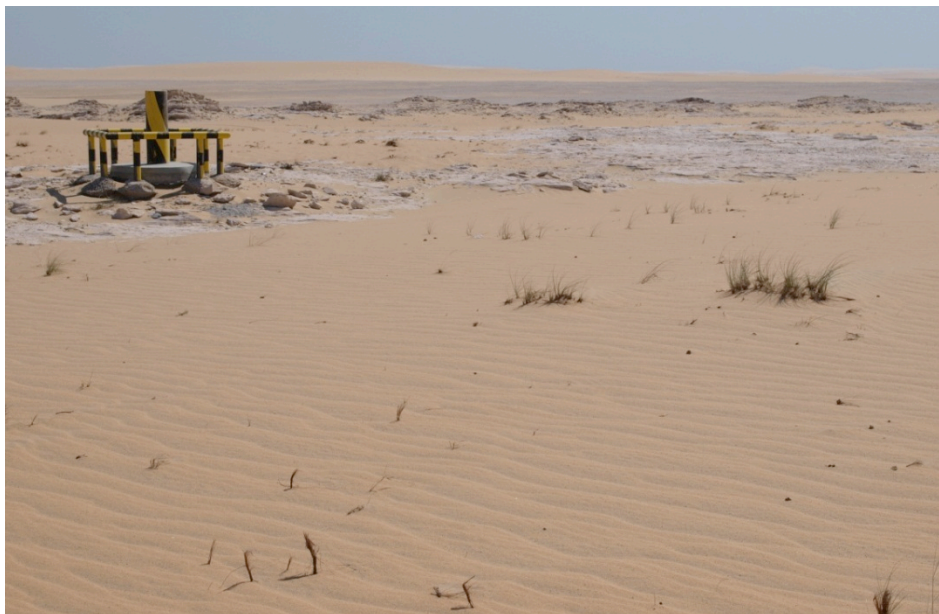


Figure 86 Trig point G8 on the bare rocky/sandy Pleistocene strand line overlooking the former marine embayment shown in the background in front of the far dune



Figure 87 Character of eroded strand line at G8



Figure 88 Northern edge of partially covered strand line at G8

The site is on the edge of a marine embayment of the Flandrian sea, with rising ground to the north and south. The Pleistocene strand line along the border of the rising ground also marks the limit of the later mid-Holocene transgression

“A date was obtained from marine shells: 7520 ± 90 BP (Gif sur Yvette5938). That date, uncorrected, seems somewhat old if we admit that the “stalked points on blade” have preceded arrowheads with fins. Recall that $6,970 \pm 130$ BP is the only date obtained in Qatar for a deposit that has stalked points located close to Shagra” –Inizan - p 124.



Figure 89 Looking south towards G8



Figure 90 Sandy depression in the paleo-shoreline at the Shagra site with car tracks

Summary: The data in Inizan - *Mission Archéologique Française en Qatar, Volume 2* closely links the Shagra archaeological site and the excavation with the G8 trig point. Although the exact position of the excavation in the rocky, broken and sand-encroached topography at G8 remains to be identified, there are very few areas close to G8 where it might be. The most likely location is that shown in Figure 83 where two iron marker pegs protrude from the sand.

4.3 Archaeological potential in the vicinity of Shagra

The WSW-ENE strand line (Fig. 3) on which Shagra lies is one of a several strand lines in the vicinity of Shagra, the next most prominent being the N-S line shown in Figure 81

A cursory examination of the area shows that the most favourable area for early occupation lies around a high aeolianite ridge outcropping about 2 km to the northeast of the northern end of the N-S strand line, in the vicinity of 24.9098 N 51.466367 E (Figure 91). It contains the trig point G07. The aeolianite lies on a pediment formed across bedrock and Pleistocene sediments, bounded in turn by the 7000-4000 year BP shoreline. Small, brown vitreous chert debitage including flakes and blades, are present both on the shoreline and on the aeolianite ridge, their presence on the aeolianite ridge suggesting that they were transported there. Badly weathered, coarse pottery was also present. Today, there is a hand-dug well immediately to the east (24.90525 N, 51.468933 E), this being the only well sighted in the area, perhaps reflects localized recharge on the aeolianite with its large internal depressions

(Figure 93). The well is in an area which would not have been inundated at the time of the Shagra occupation; however, no claim can be made to its age. Whatever the age, it is also likely that water collected in the many large rock-lined depressions within the aeolianite during storms throughout the Holocene period. The depressions also provide excellent protection from the winds, a situation described for the Shagra fisherman's hut.

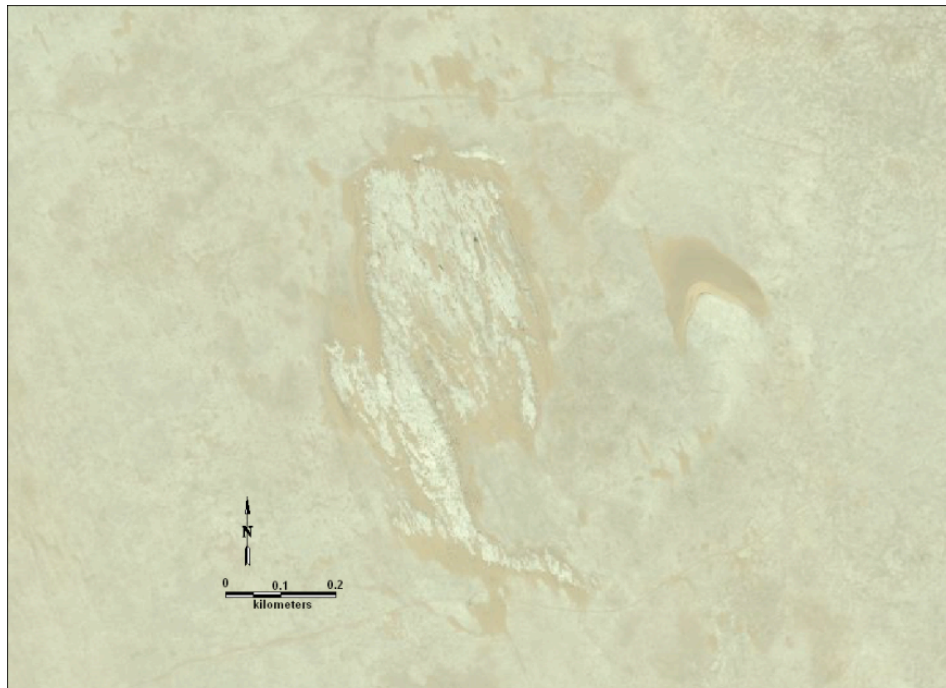


Figure 91 Aeolianite outcrop located 7 km NNE of Shagra



Figure 92 Aeolianite ridge overlooking the former marine embayment

Figure 93 Hand-dug well in vicinity of the aeolianite

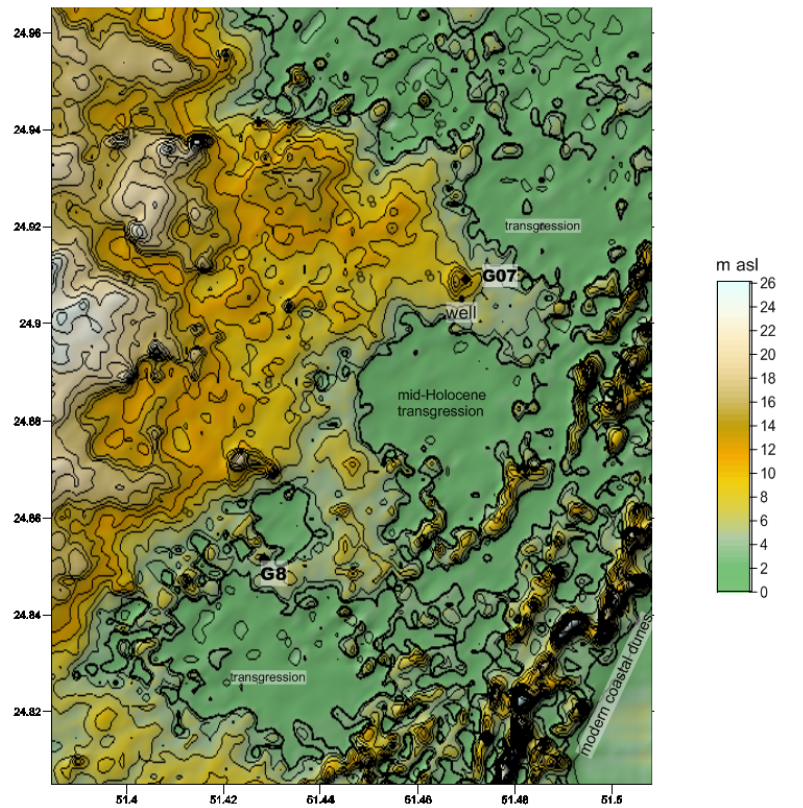


Figure 94. Location of the mid-Holocene shoreline with the G8 (Shagra) and G07 localities showing various embayments and promontories.

There is a clear relationship between the Shagra site near G8, and the aeolianite site at G07, since both lie at high points in the landscape on peninsulars extending into and overlooking what would have been the mid-Holocene sea occupying embayments cutting into the Dammam Formation (Figure 94). The edge of the marine transgression is approximated by the 3 m contour, while the 6 m contour approximates the upper limits of the pediment formed as a wave-cut platform and marine terrace, developed at the time of the earlier transgression responsible for the Pleistocene aeolianite and shallow marine and beach sediments from which it was derived.

Elsewhere, to the north of the Shagra site, small structures were observed on and adjacent to the N-S strand lines (Figure 95 and Figure 96).



Figure 95 Small structure on a Pleistocene strand to the north of Shagra



Figure 96 Mosque on gravelly plain to the north of Shagra

4.4 Region to the west of Shagra

Access to Shagra may be gained from a number of directions, the shortest track is from Sealine Beach; however, there is also access from the north and west from the small village of Al Khubayb, via the Shagra camel station located about 4 km to the southwest of the Shagra site. On the track passing SSE from Al Khubayb, a group of small limestone structures partially sand-covered occurs at 51.31579 E, 24.9710 N.



Figure 97 Stony plain and sand dune topography between Al Khubayb and the Shagra camel station

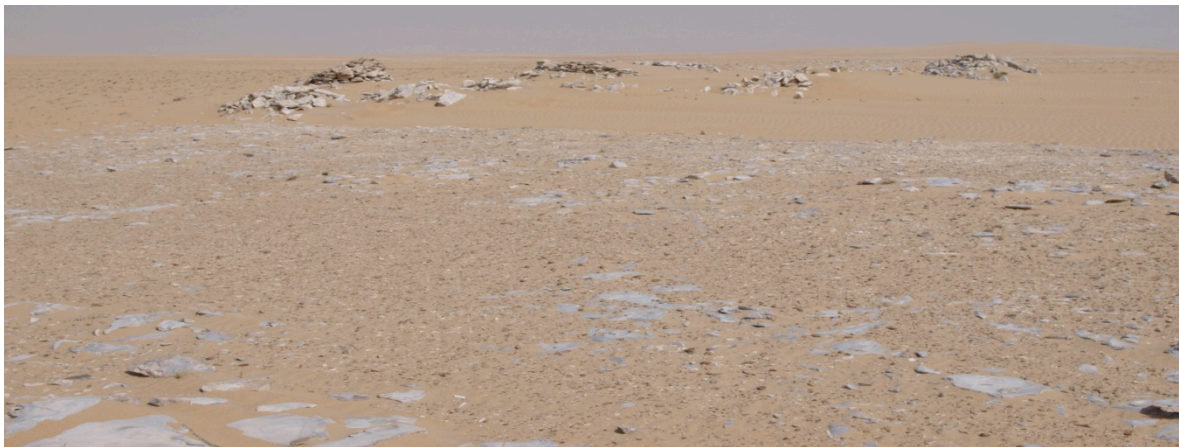


Figure 98 Group of structures on stony, rocky plain between Al Khubayb and the Shagra camel station



Figure 99 Structures on a stony, sandy and rocky plain between Al Khubayb and the Shagra camel station



Figure 100 Structures on a stony, sandy and rocky plain between Al Khubayb and the Shagra camel station

5 Archaeological sites in north-western Qatar – a contrast to the south

To contrast the nature of sites between the south and the north, a number of sites were examined along the north-western coast-line and its immediate hinterland. Most are well known, but in a few instances new sites were uncovered. Of special interest was the small early Islamic (Abbasid?) linear village of Haddayah, where a small qibla and mihrab mosque was located at the north-eastern end of the village.

5.1 Al Haddayah linear village

An early overlap of the two scenarios represented by isolated qibla-mihrab mosques and larger settlement mosques is seen at Al Haddayah (Figure 102) in north western Qatar, where a qibla-mihrab mosque forms part of a small Abbasid linear settlement, near the town of Abu Sidrah, (Figure 103 and Figure 109) located about 17 km to the north of Jumalaya. Al Haddayah is the most south-westerly of the early Islamic linear villages so far identified in northern Qatar. The village lies on a ridge overlooking two treed depressions on the north and southern sides. The qibla wall lies roughly at right angles to the line of the village (Figure 101). Several graves were present adjacent to the houses and coarse grained pottery and turquoise glazed pottery were present (Figure 106).

A number of earlier cairn sites in the vicinity to the north (Figure 103) and a number of other cairn sites were recorded by De Cardi (1973) across the region



Figure 101 Qibla with mihrab at the north-eastern end of the small linear village at Al Haddayah



Figure 102 South-western end of Al Haddayah linear village. The mosque is near the car

The Al Haddayah linear village, as do the other linear villages, has a NE-SW orientation (Figure 110), and is constructed on a small watershed between two small variously vegetated depressions, lying at levels of only 6 m above sea level. The depressions occupy a larger N-S elongated depression, with the surrounding higher ground, especially to the east, providing a local catchment for run-off and recharge. It lies within the extended calcareous zone, with its better quality groundwater and given that the water table would have been at a depth of only 5-6 m, and therefore within easy reach by hand dug wells, it is likely that at the time of occupation the water supply came from wells located in the depressions.

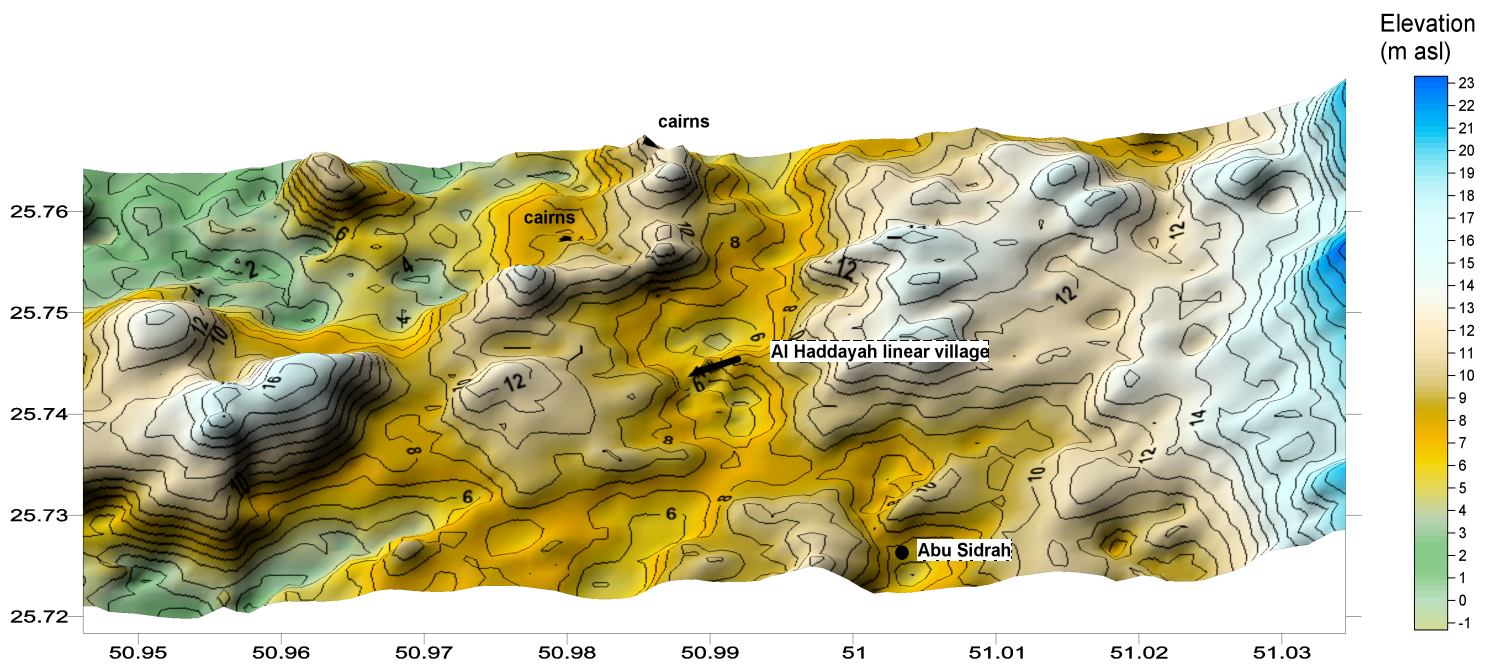


Figure 103 Topographic map with Al Haddayah linear village and nearby cairns

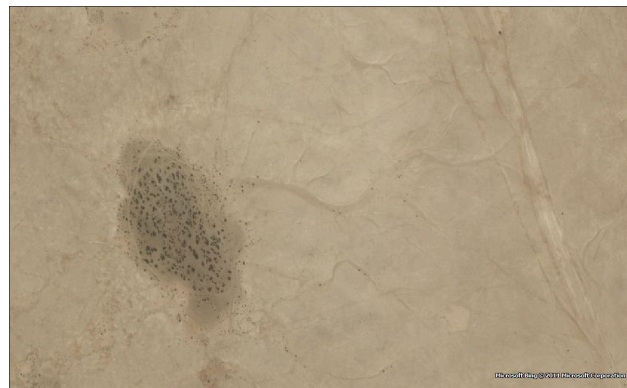


Figure 104 Vegetated depression to the south of Al Haddayah with feeder drainage lines



Figure 105 Small house at Al Haddayah overlooking a vegetated depression

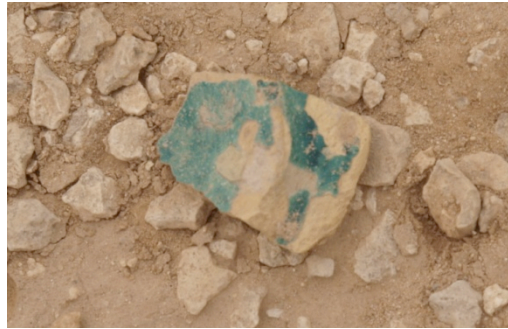


Figure 106 Turquoise glazed pottery from Al Haddayah



Figure 107 Sheep grazing in a depression at Al Haddayah



Figure 108 Lightly vegetated humpy depression floor showing a playette surface pattern suggestive of seasonally shallow water tables



Figure 109 Lightly vegetated depressions in the vicinity of Abu Sidrah

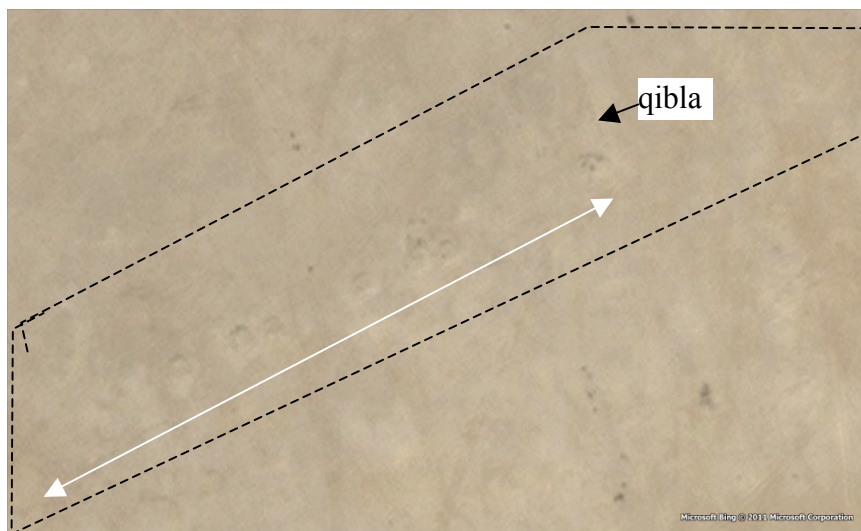


Figure 110 Al Haddayah linear village with qibla at the NE end (direction of Kaaba, Mecca - 249°)

5.1.1 Comparison with other linear structures

The central north western coast and further inland provides a marked contrast in occupation density to that in the south of the country, with innumerable sites scattered across the landscape. Much of this area lies within the extended zone of carbonate aquifer system where potable groundwater occurs. The nearest settlement to Al Haddayah featuring linear distribution of structures is at the large Abbasid site of Murwab, located about 12 km to the north and about 6.7 west of Na'man.

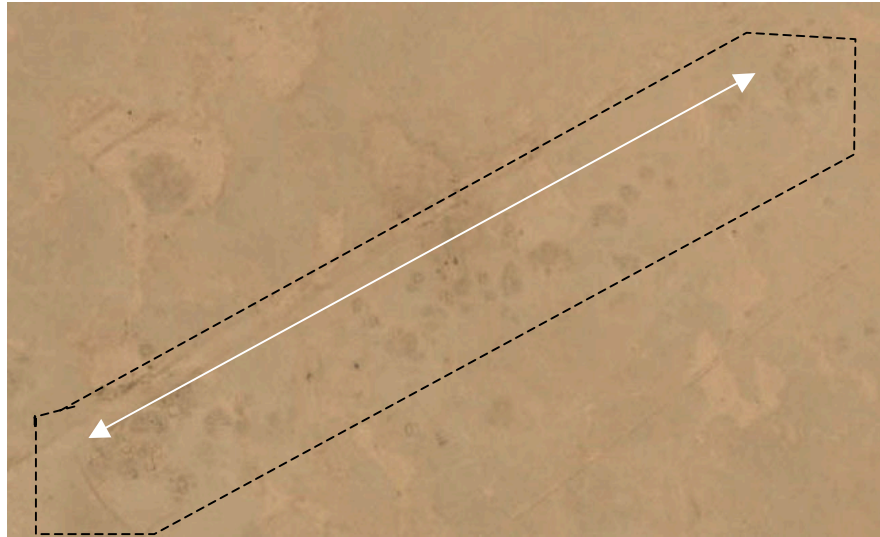


Figure 111 NE-SW orientation in linear in Murwab Abbasid linear village
(direction of Kaaba, Mecca - 249°)

Murwab and Al Haddayah have a similar orientation to other linear villages in northern Qatar, such as that at Al Kilab (Macumber, 2011); in all three sites, turquoise glazed pottery was present.

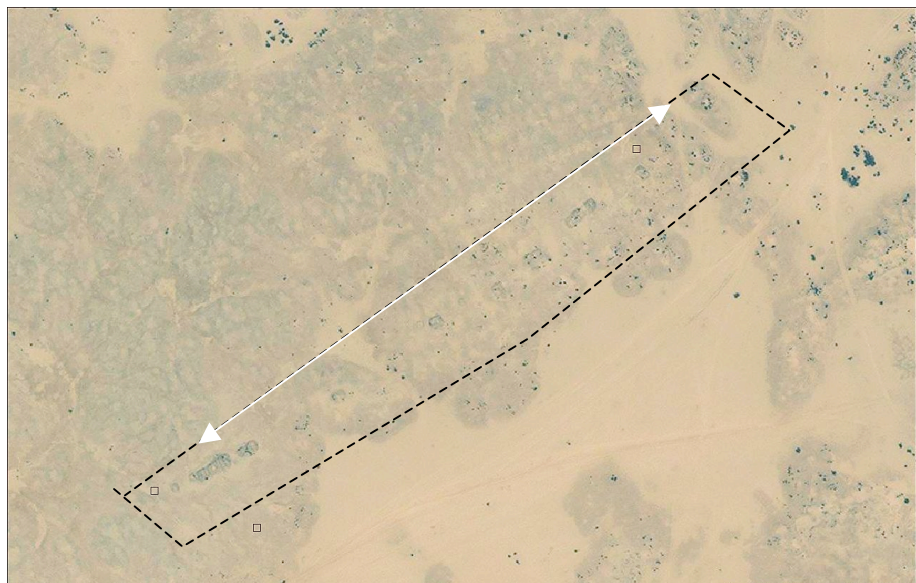


Figure 112 Umm al Kilab linear village - length 400 m
(direction of Kaaba, Mecca - 248°)

The various linear villages observed across northern Qatar have a similar NE-SW alignment. Whatever the rationale for this alignment, using the Kaaba at Mecca as a focus, the directions for the three sites above taken from the most furthest of the structures in each case are:

Table 1 - Alignment of selected linear villages

Locality	*Alignment of structures	Direction of Kaaba (Mecca)#
Umm al Kilab	237°	248° (-111.81°)
Murwab	241°	249° (-111.17°)
Al Haddayah	244°	249° (-110.66°)

* approximate

#The slight change in direction is explained by the difference in longitude and latitude of the three sites

Along the coast and hinterland between Murwab and Al Haddayah are a large number of excavated sites (De Cardi, 1973), including those at Yoghbi and in the vicinity of Umm Al Ma. This area was not part of the reconnaissance but is included to emphasize the marked difference in archaeological content to that in the south. At Yoghbi there are active and infilled wells in the rawdah, and nearby small dams have been established across the rawdah floor. A water feature is filled from one of the wells. Wells are also a feature of a large forested area at Na'man, where the strong relationship between towns and rawdah is clearly seen with well defined drainage lines in the rawdah. The high density of sites along the central western coastline and further inland, an area contained within the zone of favourable groundwater, was in sharp contrast to that observed on the southern reconnaissance.



Figure 113 Excavations at Murwab



Figure 114 House at Umm Al Ma



Figure 115 Excavated cairn sites at Umm Al Ma



Figure 116 Well in rawdah at Yoghbi



Figure 117 Rawdah at Yoghbi with wells (foreground and background)



Figure 118 Pond on rawdah in the Yoghbi area

5.2 Fayshakh district

To the south of Al Haddayah and west of Jamayliyah, De Cardi recorded cairns sites (Sites 8 and 8a) located in the Fayshakh area.

5.2.1.1 De Cardi Sites 8a and 8b in the Fayshakh District

De Cardi observes in her Gazetteer that at Site 8a. Faishakh District:

Thirteen fairly well-preserved low cairns built of stone slabs were located on a former coastline overlooking sabkha near the main track skirting the coast to the south of Dawhat Fayshakh. They lie on rising ground from which it is possible to see Bir Hussein Police Post across the inlet. Midway up the stony hillside behind the cairns was an extensive scatter of flint debitage and some tools. The area appeared to be of some interest and it was accordingly left untouched for future study. And:

At site 8b. Faishakh District:

A group of six or more cairns built of piled stone slabs stands on the sabkha near a coastal track to the south-east of Dawhat Hussein. The cairns are of low profile with flattened tops and the majority show signs of disturbance. No pottery was found in their vicinity.

During this reconnaissance, a number of cairns were located at what appeared to be De Cardi's site 8 on the edge of a lightly vegetated flat (sabkha?), which probably formed as a coastal embayment associated with Dawhat Fayshakh during the period of higher sea level in the mid-Holocene period. The flat lay at the bottom of a small drainage line rising on high ground to the east, its course being determined by two small faults (Figure 120). The wadi floor was unusually sandy and a government observation bore with water level recorder is established on the wadi floor, which is lightly treed, probably reflecting shallow groundwater. The sand would have enhanced recharge from localized runoff. A number of cairns were observed where De Cardi's site 8 was estimated to be, and from where the Bir Hussein Police Station was visible across Dawhat Fayshakh. Between the cairns and the observation well are a number of structures which appeared to be earlier settlement walls and later Bedouin encampments. The structures and encampments imply fresh groundwater water was occasionally present in the depression, probably at a shallow depth below the surface. While there is no indication of the age of the structures De Cardi observed " *up the stony hillside behind the cairns was an extensive scatter of flint debitage and some tools. The area appeared to be of some interest and it was accordingly left untouched for future study*". It is notable that the Aburuk Peninsular with its numerous sites including Neolithic sites at Bir Aburuk (site 4, Figure 125) lies directly across the Dahwat Fayshakh and the Dahwat Hussein (De Cardi, 1973) from the Fayshakh area.



Figure 119 Observation bore in the lightly treed, sandy wadi at Fayshakh

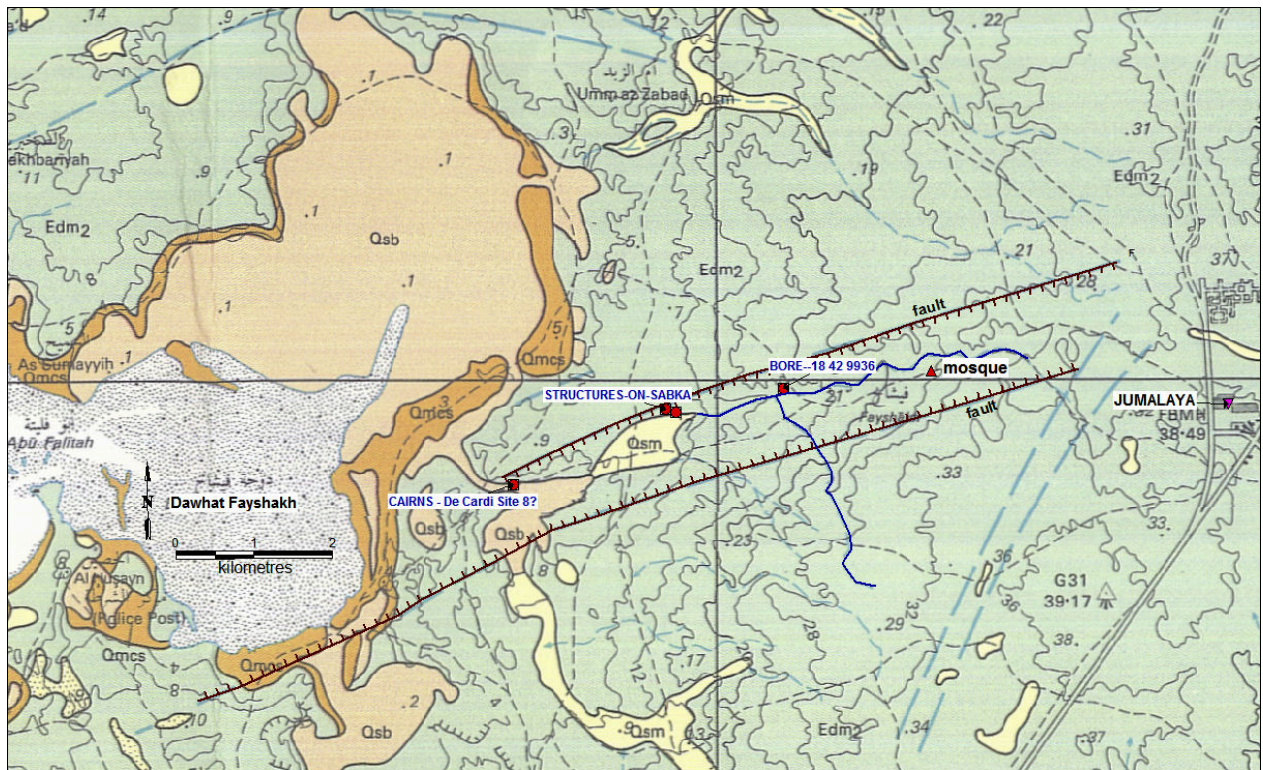


Figure 120 Geological map with location of De Cardi site 8 and additional sites, on the edge of a small wadi-fed depression flanked by fault lines



Figure 121 Structures on the edge of the depression at Fayshakh



Figure 122 Walls of a structure on the edge of the lightly vegetated depression



Figure 123 Structure on the edge of the depression

The suitability of Wadi Fayshakh as an occasional water source and therefore a basis for visitations and perhaps occasional settlement was also observed at a locality lying about 2 km eastwards of the observation bore. This may have been the actual site of Fayshakh, as shown on the earlier maps. Here a small mosque and a number of nearby structures, including graves, occur on either side of the track to Jumayliyah.



Figure 124 Small mosque on the Fayshakh track, west of Jumayliyah

The Fayshakh occurrences and the higher density of sites in the vicinity is typical of much of the north-western and northern coastline and hinterland from Umm Bab in central western Qatar to Al Zubarah in the northwest and beyond Al Khor in the northeast. The higher density of occupation and/or frequent visitations in northern Qatar is readily seen in the sites around the Acila Depression of the Umm Bab region (Inizan, 1978; 1988) which appear to mark the southernmost limits of higher density occupation in the west, and is in sharp contrast to that observed further south.

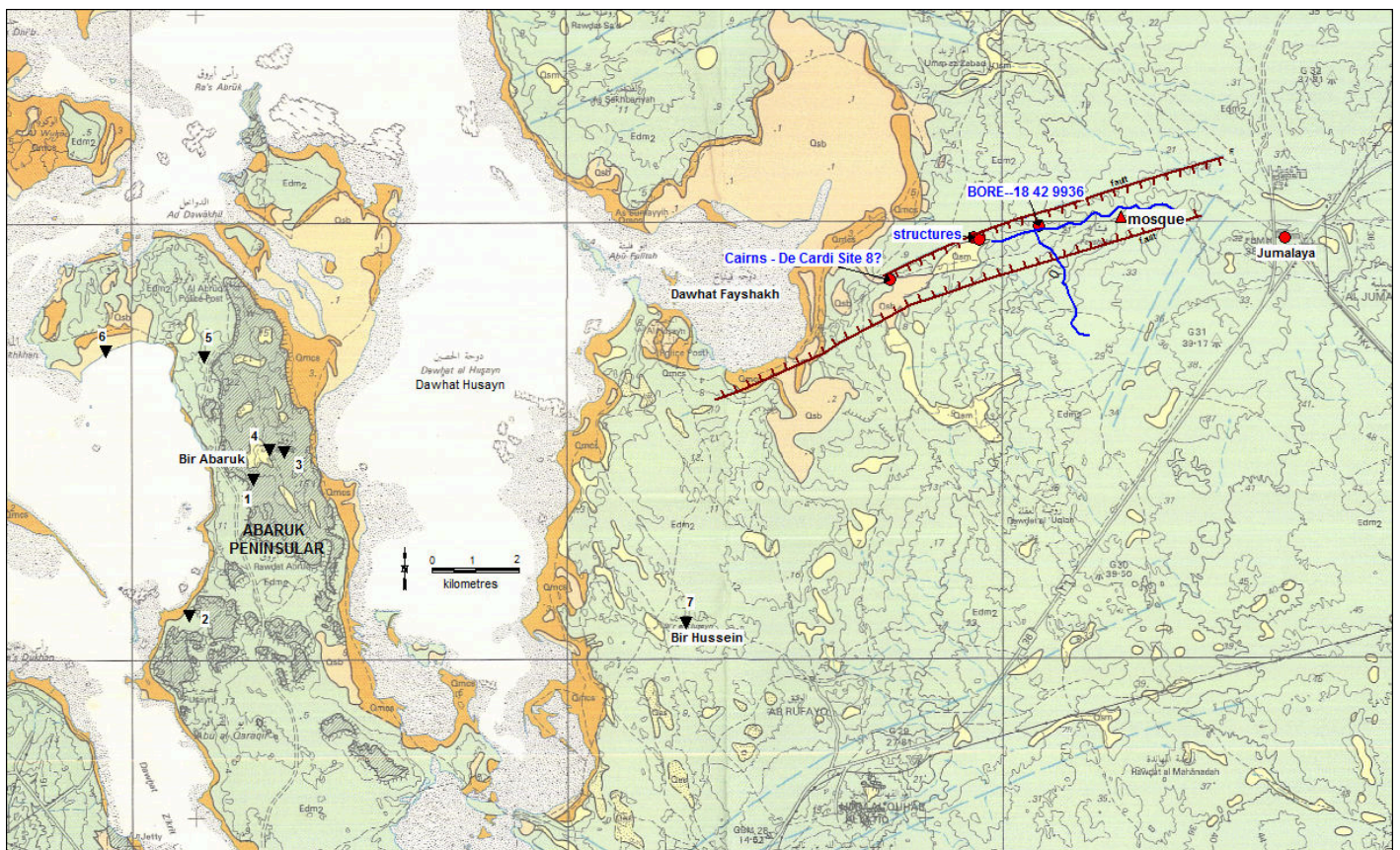


Figure 125 De Cardi sites on the Abaruk Peninsular and the Fayshakh sites (sites numbered as in the De Cardi 1973 register)

5.3 Acila depression - a northern yardstick for southern sites

The Qatar B site at Shagra is one of the earliest sites in Qatar, with a date of 7,500 yr BP. It lies on the edge of one of the many promontories and embayments in the southeast of Qatar which existed at the time of the mid-Holocene high sea level. This was much the same age as sites near Acila in western Qatar to the north east of Umm Bab, between Al Kharsa and Al Bhath, where a large number of archaeological sites ranging upwards in age from ca 7000 yr

old were described by the French Expedition to Qatar and by De Cardi. A number of additional sites were noted during this study.

The central western areas of Qatar lie outside the zone of better quality water defined by the extended carbonate zone (Figure 18), and to this extent have similarities with southern Qatar. Nevertheless, the areas perhaps represents the southern-most occurrence of higher density occupation observed across northern Qatar, spanning many time periods. Given the major physical hydrological constraints to occupation in southern Qatar outlined above, the Acila setting was adopted as a reference by which the mid-Holocene 'bay-promontory' landscape adjoining the south-eastern shoreline of Qatar could be compared. Unlike the large depressions in the south, the Acila Depression occupies a low position in the landscape, the base being only about 3 m above present sea level and its rim at ca 20m; it was perhaps connected to the coast at the height of the mid-Holocene transgression, however this is uncertain.

The published Acila sites (e.g. Site 36) are best known because of the artifacts, including blade arrowheads, comparable with material Pre-Pottery Neolithic B sites in Syria and Israel. Pollen analysis suggests that site 36 may have been situated alongside a lake ringed by halophytic plants, reeds, and trees, no doubt a watering hole that attracted game.



Figure 126 Small circular structure with a cairn in the background, near Al Bhath

The French sites 13 to 27 shown in Inizan (1978) are found to the south of the depression on a high-level terrace, defined by the 20 m to 30 m contour, having Al Kharsa, where small grassed rawdah first appear, at its eastern limit. The cairn sites continue eastwards to beyond Al Kharsa (Figure 127 and Figure 131), which appears to have been an ongoing centre for occupation.

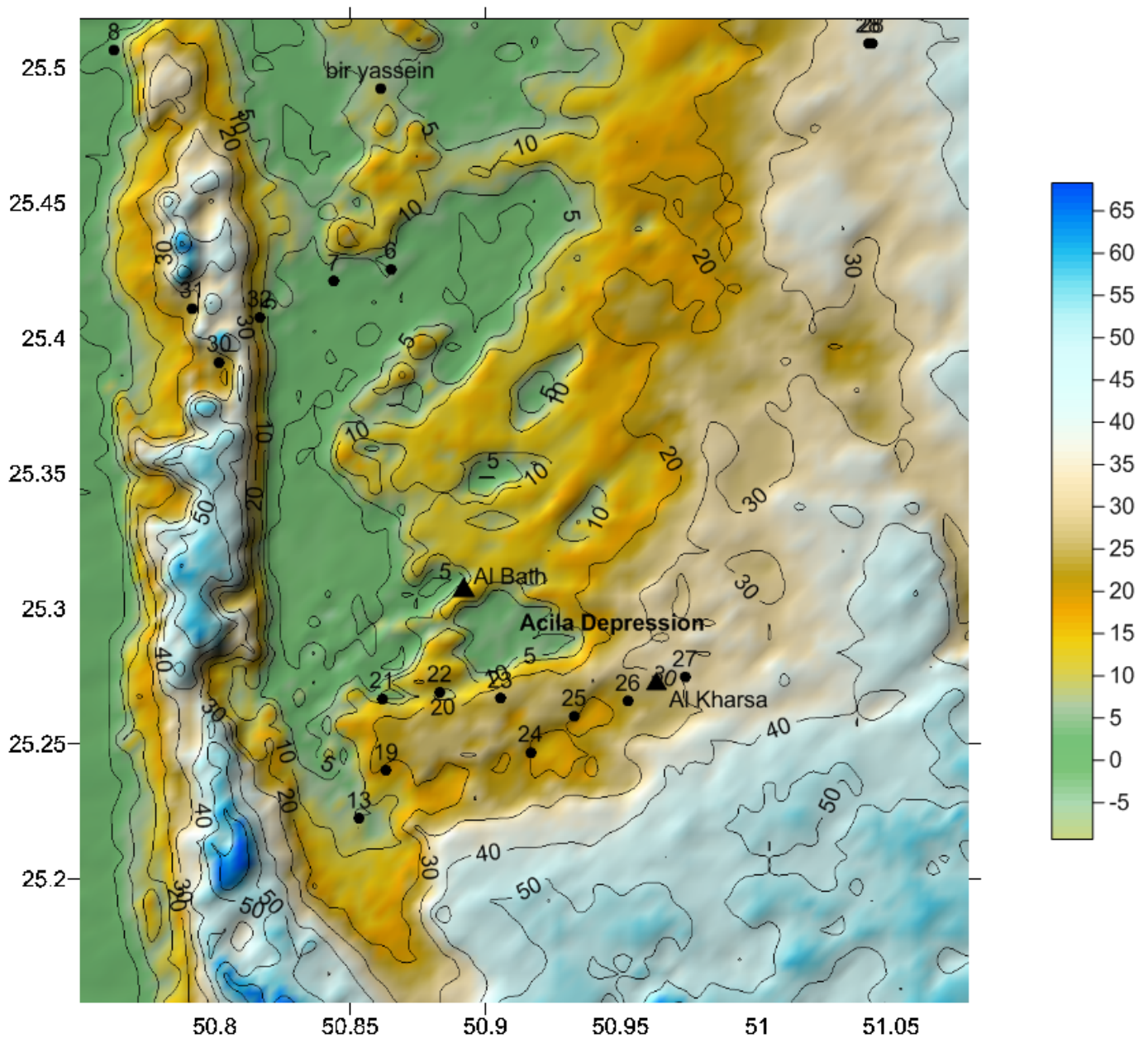


Figure 127 Landscape in the vicinity of the Acila Depression showing the approximate location of the French sites recorded by Inizan, (1988)



Figure 128 Edge of the Acila Depression, looking south



Figure 129 Grassy depression to the west of Al Kharsa (background)



Figure 130 Cairn near the French site 27 (Fig. 127) looking towards Al Kharsa

The precise localities of the French sites were not known, however, an attempt was undertaken to re-locate them, and in doing so examine their nature in the context of the surrounding (palaeo) landscape. In addition, a traverse was carried out along the northern and eastern end of the depression during which a number of additional cairn sites were noted. The nature of the plateau landscape was bare limestone surfaces with a thin stony cover, perhaps best seen at site 25 where limestone was taken from adjacent surface outcrop to construct

cairns. Comparatively good quality pebbly chert was widespread across the area providing a ready source for artefacts (Figure 133). As is the case across much of Qatar small circular structures were noted at a number of locations, however the most prominent features were the ubiquitous cairns, concentrated both on the terrace (French site 25 - Figure 131 and Figure 135), and overlooking the northern and eastern edges of the depression (Figure 131, Figure 136 and Figure 137).

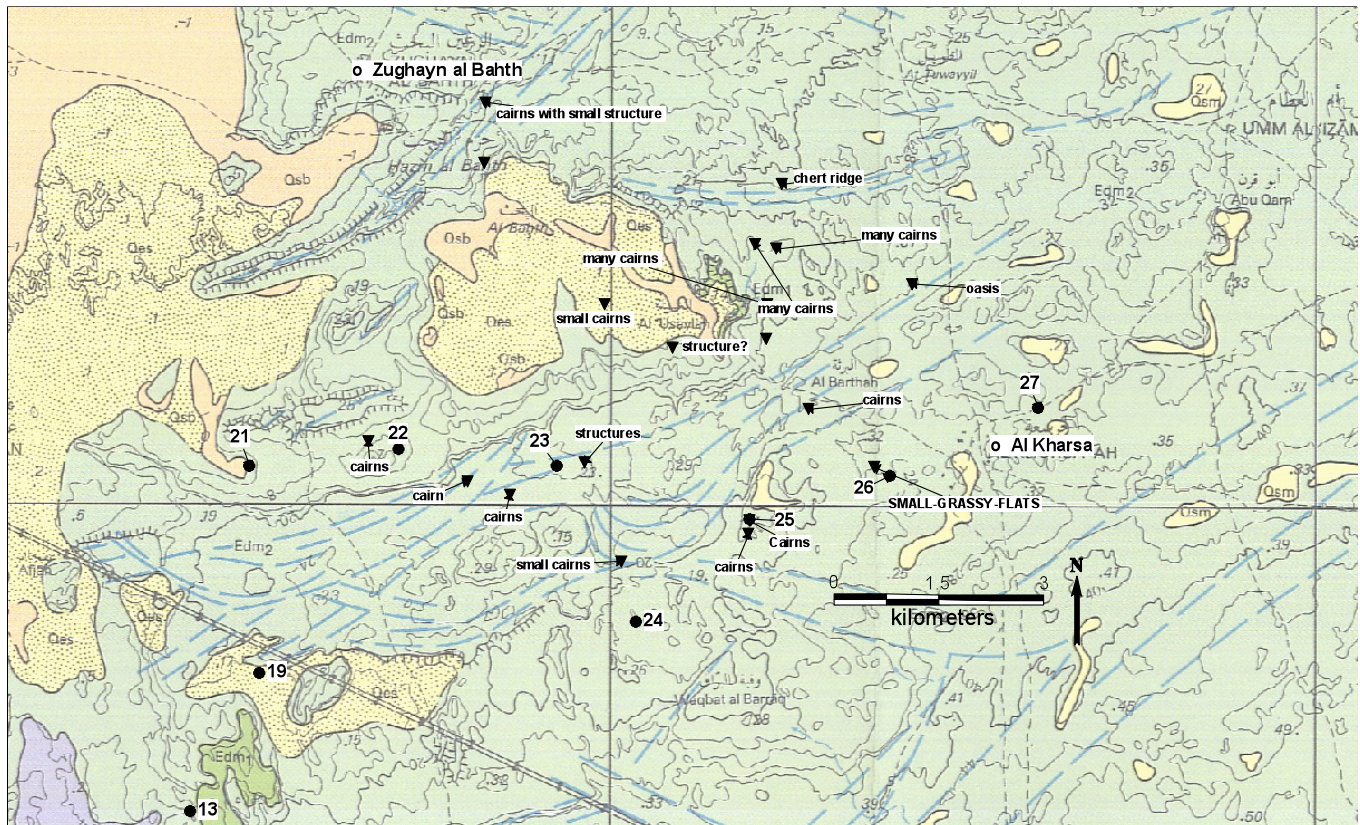


Figure 131 Sites observed in the area between Zughan Al Bahth and Al Kharsa - the numbered sites were taken from Inizan, 1988



Figure 132 Pebbly surface of the Acila terrace



Figure 133 Chert pebbles on the Acila terrace floor



Figure 134 Small circular structure located on the flat pebbly terrace



Figure 135 Cairn at French site 25 - with a thin sequence of pebbles with scattered chert, overlying limestone



Figure 136 Cairns on the skyline at the north-eastern end of the Acila Depression



Figure 137 Cairns shown in Figure 136

The high concentration of sites found on the terrace adjacent to the Acila depression is representative of the archaeological record along much of the north-western coastline, and across much of northern Qatar. On the high promontory to the west of the mid-Holocene embayment between Dukhan and Umm Bab, a number of sites were recorded by Kapel, De Cardi and the French Expedition to Qatar. They included sites ranging in age upwards from a 5th millennium BC Neolithic coastal settlement (Smith, 1973), with 'Ubaid pottery occurring at the Da'asa Site 46 (locality - sites 45-47 De Cardi). Smith (1973) observes that the Da'asa site 46 where arrowheads were present, suggests a seasonal settlement.

A large number of cairn-fields were described (Buckley, 1973), and these feature across the north western country-side.

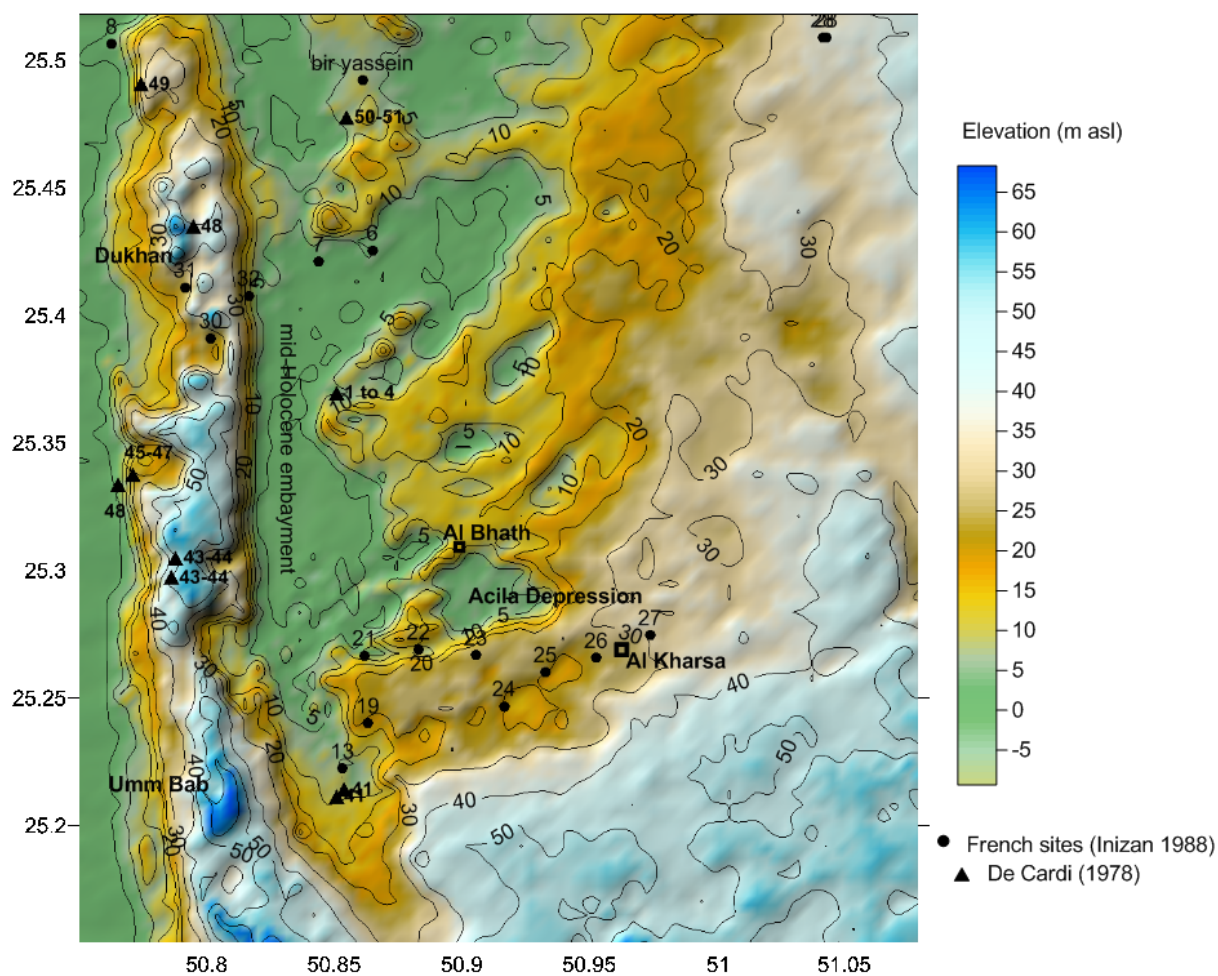


Figure 138 Dukhan - Umm Bab - Al Kharsa area with the French and De Cardi sites

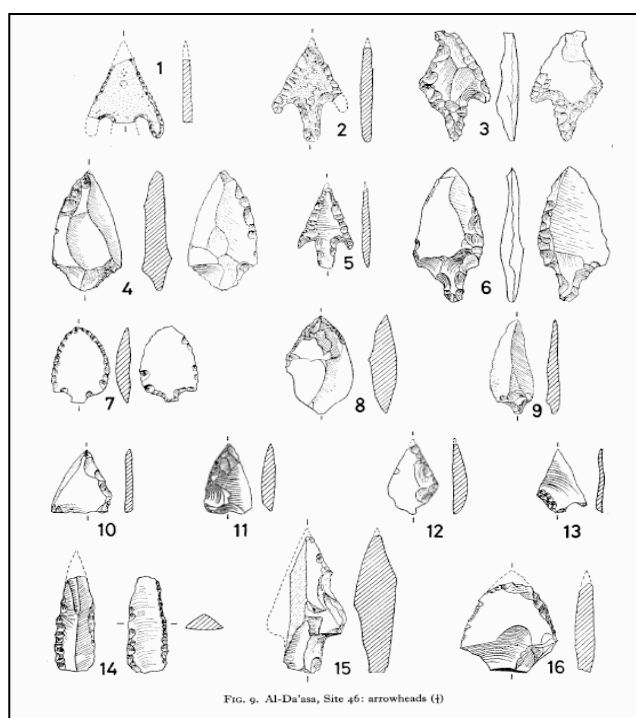


Figure 139 Arrowheads from the Al Da'asa site 46 (Smith 1988)



Figure 140 Excavated structure on the limestone plateau in the Dukhan area

Large cairn fields have been previously described from the Abaruk Peninsular (De Cardi, 1973), and further to the north along the coast various aged sites were described and excavations undertaken from a number of locations, such as Bir Husain (De Cardi), and at Umm al-Ma (Shreiber et al., 2008/9). South, beyond Umm al-Ma, is the most southerly known occurrence of an early Islamic linear village at Al Haddayah, with similarly aligned settlements at Murwab (Guerin and Al-Naimi, 2010) and others occurring scattered across northern Qatar to Umm Kilab, and Athbar in the far north west.

Similarly to the north on the Abaruk Peninsular a number of sites were described. A feature of the region overall is the presence of a low coastal terrace representing deposition during the Pleistocene high sea level (Figure 141). The terrace abuts higher deeply eroded limestone plateau sequences on which the cairns are a prominent feature. The terrace is also an important archaeological area since it borders the higher shore-line present during the mid-Holocene Flandrian transgression, and was a favourable area for chert accumulation and associated sites. This is the case at sites 7 and 6 to the east of Dukhan (locality Figure 138)

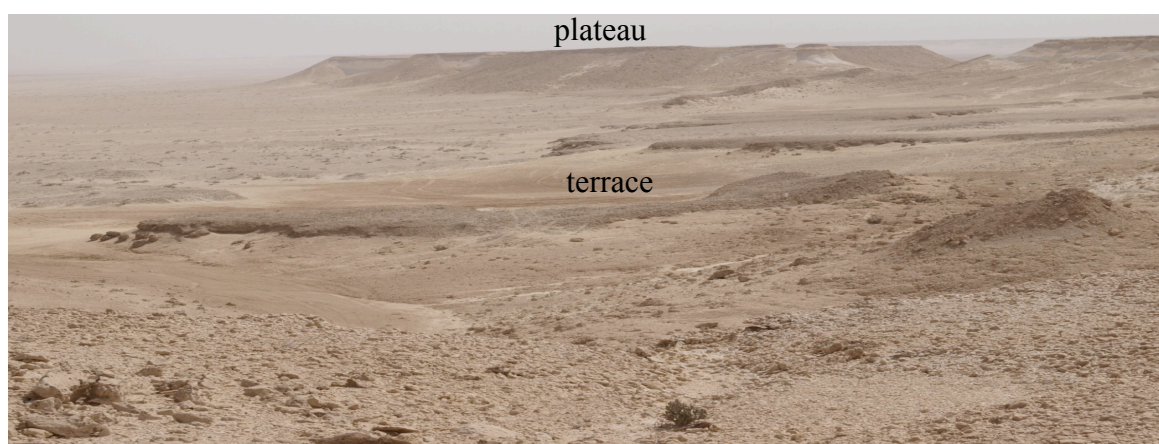


Figure 141 Plateau-terrace landscape bordering the shoreline of the mid-Holocene sea

6 Conclusion and Discussion.

In Qatar there is no permanent surface water, and potable water was obtained from the groundwater system using shallow hand-dug wells. Permanent settlement was determined by the presence of potable groundwater within ready reach by hand-dug wells. The distribution and nature of the sites described here represent two markedly different physical settings, resulting primarily from groundwater availability and salinity distribution across Qatar.

In the north there is a wide diversity of occupation sites ranging from those representing temporary visitations to those of permanent settlement. Permanent settlement occurred in areas where there was potable groundwater within reach by shallow hand-dug wells, most commonly closer to the coast. In the south, there were relatively fewer settlements and instead occupation took the form of temporary encampments and visitations during and often in response to wet seasons or following discrete wet events.

In addition there was a more general passage across Qatar made possible by the ability of camels to utilize brackish to saline groundwater.

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Appendix 2

REPORT ON THE FISH BONE FROM FREIHA AND AL ZUBARAH

Lisa Yeomans

1.1.1 Introduction

Past exploitation of the abundant fish resources resulted in fish bone forming a large proportion of the faunal material excavated from Al Zubarah and Freiha. During the 2011 to 2012 season progress was made on developing a fish bone reference collection, creating a reference guide for fish bone identification and starting to analyse the fish bone recovered from ZUEP01. The analysis of the fish bone began with the material recovered from two cooking rooms, Space 110 and Space 166, in two courtyards houses (Compound 1 and Compound 2). These two rooms produced large fish bone assemblages that derived from cooking activities and provide an interesting comparison of the diet in two Phase 5 courtyard houses. The information provided by the fish bone analysis will eventually allow a much greater interpretation of the use of marine resources and future research questions are also discussed.

1.1.2 Reference collection

A total of 62 specimens of fish have been prepared for the reference collection. These derive from 56 species of fish representing 37 families and cover the majority of the families of fish commonly found in the archaeological assemblage. The reference collection is, however, still incomplete and a small proportion of the archaeological material cannot yet be identified because of the gaps in the reference collection.

In addition to the creation of reference collection of bones, work has started on a guide to aid in the identification of fish bones using photographs of the reference bones and annotated drawings. An example of some of the work is shown in (Fish Bone-Fig 1)

1.1.3 Methodology

In the analysis of the archaeological material, after the initial sorting of fish bone from mammalian and bird bone, the different classes of bone were weighed and general description of the fish bone in the locus was noted. The next stage is to record the individual fish bones that can be identified to family, genus or species level. Not all elements of the fish skeleton are recorded due to the size of the available fish bone assemblages and the difficulty in identifying some elements to specific families or beyond. Previous researchers working on Arabian Gulf fish

assemblages (Beech 2004) and on fish bone assemblages in general (Colley 1990) selected specific elements to be recorded further. Elements recorded were the articular, basioccipital, cleithrum, dentary, hyomandibular, maxilla, post-temporal, premaxilla, opercular, quadrate, vertebra and vomer (Fish bone Fig 2). A few additional elements specific to certain species were recorded such as the pharyngeals of parrotfish.

1.1.4 Fish bone from cooking rooms in courtyard houses

Space 110 and Space 166 are two cooking rooms within two courtyard houses. The stratigraphic sequence in these rooms comprised of occupation deposits and trodden surfaces building up as *tannūrs* were used for cooking within the rooms. The *tannūrs* were replaced over time with the later *tannūrs* often cutting earlier ones. The occupation deposits yielded a substantial quantity of bone, of which the majority was fish bone. A large proportion of the fish bone from Space 110 and Space 166 has been recorded. However, an important part of the analysis of the fish bone from these rooms will be the material found within the numerous *tannūrs* that were excavated and fish bone from these features will be in the flotation samples taken from the *tannūr* fills. Additional flotation samples were taken from the occupation deposits so the recorded fish bone assemblage is not yet complete so a detailed statistical analysis of the fish bone is not yet possible.

In total 3832 fish bones have been identified to family, genus or species level with groupers (Serranidae), emperors (Lethrinidae) and seabream (Sparidae) dominating the assemblages from the cooking rooms in both courtyard houses. These families of fish are demersal and inhabit the coastal waters around Qatar. Of the groupers, the orange spotted grouper (*Epinephelus coioides*) is the most common species and occurs in coastal waters up to a depth of 100m inhabiting coastal reefs and brackish water associated with sand and mud substrates (Grandcourt *et al* 2005). Orange spotted groupers are commonly caught in dome-shaped fish traps set in strings sea floor. The same traps are often used to catch emperors which occur in near shore waters. The spangled emperor fish (*Lethrinus nebulosus*) for example occurs to a depth of 75m over a variety of habitats with large schools of juvenile fish found in shallow, sandy, sheltered water and adults living solitary or in small schools (Grandcourt *et al* 2006a). Several species of sparids have been identified within the archaeological assemblage. The kingsoldier bream (*Argyrops spinifer*) inhabits coastal waters from a depth of 100m over a range of substrates (Al Mamry *et al* 2009). Haffara or goldstripped seabream (*Rhabdosargus* sp.) and the various species of sparids with the *Acanthopagrus* genus also occur in shallow coastal waters (Grandcourt *et al* 2004). A large proportion of the fish consumed in the two courtyard houses were probably locally caught using fish traps (*gargour*).

Carangids are a large family of open water fish ranging from coastal to deeper waters. Amongst the species identified were queenfish (*Scomberoides* sp.) which are a species commonly caught

in intertidal fixed stake traps (*hadza*) (Al-Baz *et al* 2007) and still caught in the stone fish traps near Freiha. Further evidence for the use of the stone fish traps found in the intertidal are the bones of mojarra (*Gerres* sp.); this family of fish are often targeted by intertidal traps (Grandcourt *et al* 2006b). Other fish potentially caught in the stake traps are mullets and to lesser extent rabbitfish (*Siganus* sp.) and some species of seabream (*Acanthopagrus latus*).

Parrot fish were also well represented in the faunal assemblage and would have been caught near the local reefs. Lower proportions of fish from non-local waters are also present in the faunal assemblage from Spaces 110 and 166. Kingfish (*Scomberomorus* sp.) and tuna bones were present, although uncommon. These species of fish are more common in deeper waters to the northeast of Qatar. In addition to the species mentioned small numbers of other fish were present including sea catfish, needlefish, requiem shark, flathead and silver pomfret. At present the preliminary analysis suggests that the fish consumed in the two courtyard houses at ZUEP01 were similar. Both contained a high proportion of locally available fish caught using the *gargour* type of fish traps and to a lesser extent the intertidal *hadza* fish traps.

1.1.5 Future research questions

In the future, once more of the faunal material from Al Zubarah and Freiha is analysed it will be possible to address a wider range of questions relating to the use of fish. For instance how does the use of the marine resources vary spatially and temporally? Where different fishing methods used prior to the Phase 5 settlement? Did the higher status occupants of the compound excavated at ZUEP04 have access to different resources compared to the locally available fish consumed by those people living in the courtyard houses excavated at ZUEP01? How did the use of marine resources at Freiha compare to Al Zubarah?

Future research will also examine the fish preparation and cooking methods though the evidence of butchery marks and burning. Is there any evidence of drying and trading fish? Thin section analysis of otoliths and the presence of seasonal species such as the kingfish may also help us to examine the seasonal use of the site and tie into the evidence for the sequence of activities that took place throughout the year. Osteometric studies will be used to reconstruct the size of fish caught adding more information on the exploitation of fishes found at different depths and possible over exploitation of fish resulting in the diminution of fish and the capture of juvenile fish.

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Ariidae
Arius thalassinus

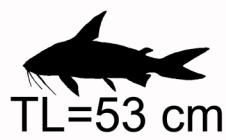


Lateral



Medial

1 cm



TL=53 cm



Carangidae
Carangoides malabaricus



Lateral



Medial

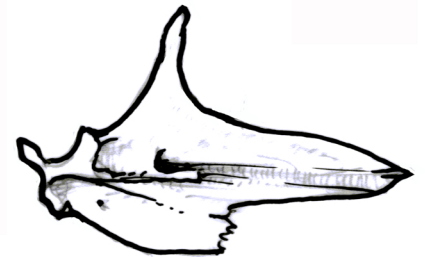
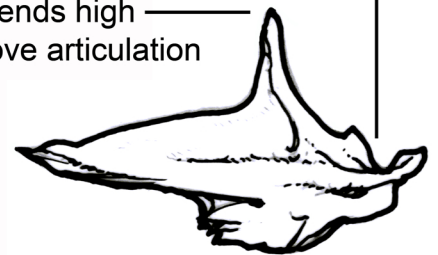
1 cm



TL=37 cm

Extends high above articulation

Narrow articulation



Carangidae
Scomberoides commersonianus

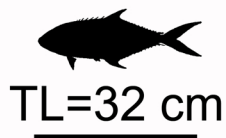


Lateral



Medial

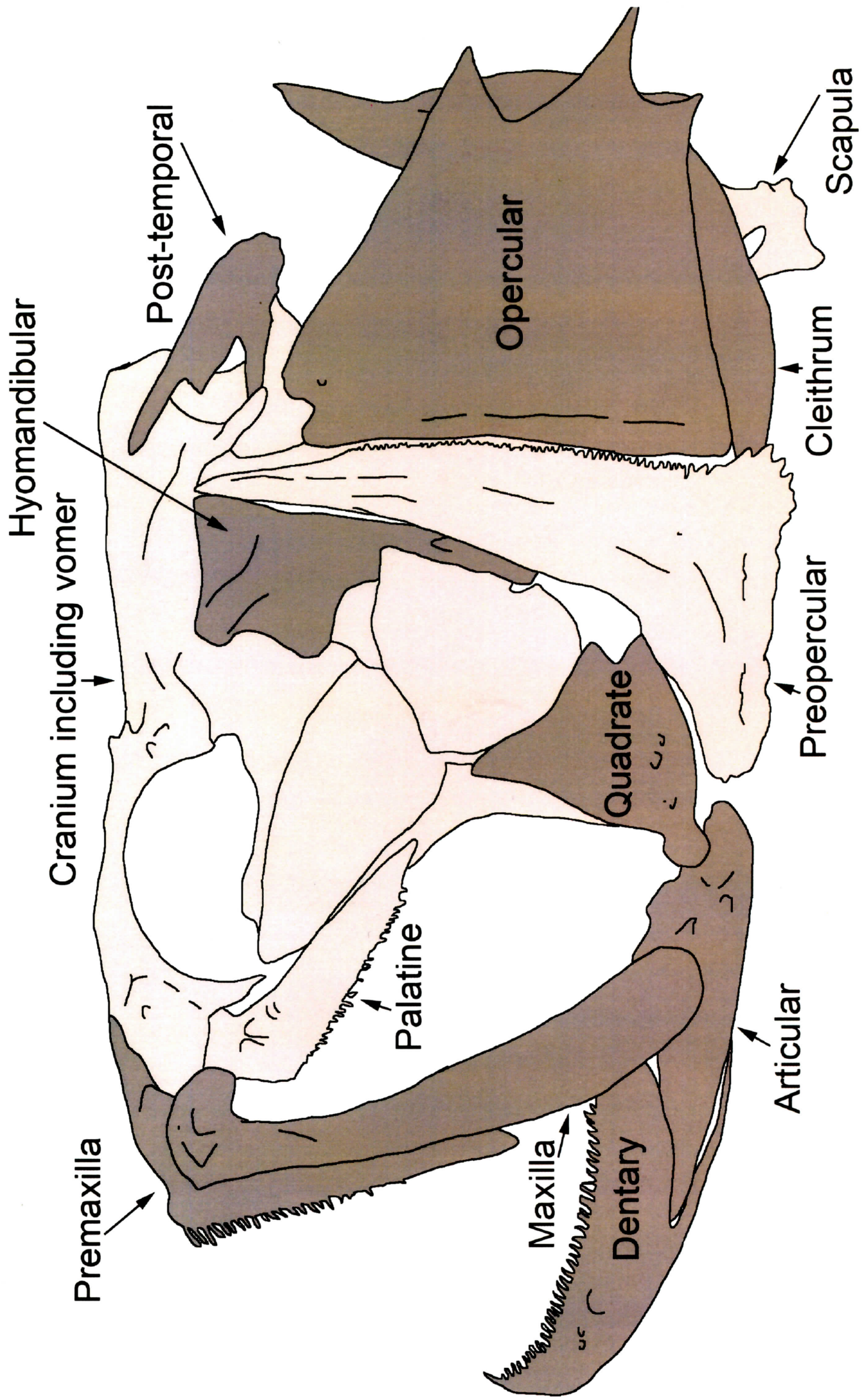
1 cm



TL=32 cm

Small articulation





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